

Catherine Neville Thomey
Arts Improvement:

OR,

Choice Experiments

AND

OBSERVATIONS

IN

*Building,
Husbandry,
Gardening,
Mechanicks,
Chymistry,
Painting,
Japanning,
Varnishing,*

*Gilding,
Inlaying,
Embossing,
Carving,
Preserving several
Things in their
Natural Shape
and Colour.*

And in other

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OBSERVATIONS
AND

Building	Cutting
Husbandry	Laying
Gardening	Barrelling
Mechanicks	Casting
Chemistry	Preparing for use
Painting	Things in Art
Navigation	Natural History
Vegetables	and Colours

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IT is the saying of a great Polititian, That to contrive for the *Publick*, and to promote the *Common Good*, ought not only to be their care to whom the Administration of Affairs is committed, but all private Persons should bend their study the same way; and whoever has received any Lights, either from *Nature*, *Education*, *Observation* or *Experience*, is bound to produce them for the Service of his Countrey. As if any one hath employed his time and thoughts, in considering *Trades*, and the common business of the Inhabitants of a Kingdom, &c. If he, I say, have gained any *Knowledge*, either by *Study*, *Observation*, *Inquiry*, or *Practice*, he should offer it to the World; since thereby at least he may furnish Materials, and give some Hints for other Heads to work upon, and improve for the Nations Profit, whereof he is a Member in the Common-wealth: Which is a sufficient Argument to irritate any one that hath an opportunity, and fit Accomodations, to promulgate so generously useful, and necessary a Design, or Project, as is this present Undertaking; viz. an *Experimental History*; as we shall hereafter shew. That Ingenious and Pious Philosopher, Mr. Got, very earnestly wisheth for such an *History of Artificial Experiments*; which together (saith he) with the *History of Extraordinary Natural Phenomenon*, are a very great *Desiderata*, and would be of very much Use and Improvement. I remember also that great Philosopher, the Illustrious and Renowned Viscount St. Albans, somewhere in his *Advancement of*

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Learning, affirms, That it is a Deficiency in Natural History, That the Co-operation of Man, with Nature in particulars, hath not been observed; And that in those Collections, which are made in Agriculture, and other Manual (or Handicraft) Arts, there is commonly a neglect and rejection of Experiments, familiar and vulgar, to which yet the interpretation of Nature, (and universal Benefit) do as much, if not more conduce, than Experiments of a higher quality. This Illustrious Person complains also of the want of an Inventory, of what in any Subject by Nature and Art is certainly, and may be undoubtedly wrought. I believe (saith the Ingenious Mr. Sharrock) his Lordship hath had many of his mind, both in former and the present Age. And that Ingenious Naturalist Mr. Ray, saith, He is sorry to see so little account made of real Experimental Philosophy.

That profound Philosopher, the truly Honourable Esq; Boyle saith, *That Experimental Philosophy conduceth to the Improving of Man's Understanding, and to the increasing of Man's Power.*

The two advantages which a real acquaintance with Nature (which cannot be obtained) brings to our Minds, are, 1st, Instructing our Understandings, and gratifying our Curiosities; and next by exciting and cherishing our Devotion.

Aristotle teacheth, and was taught himself, that all Men are desirous of Knowledge: There might be many Instances given of the prevalence of the pleasure that arises from the attainment of Knowledge: For as the Understanding is the highest Faculty in Man, so its Pleasures are the highest he can naturally receive. And therefore (saith the Honourable Esq; Boyle) I cannot much wonder that the famous Archimedes lighting in a Bath upon an Expedient to resolve a perplexing difficulty in Natural Philosophy, should forget he was naked, and run crying, I have found it, I have found it.

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! Likewise the Elder *Pliny* could not be deterred by the destructive Flames of *Vesuvius*, from satisfying his Curiosity, by endeavouring to pry into the cause of it, and thereupon approached so near that he lost his Life, by endeavouring to encrease his Knowledge.

We dayly see also that *Chymists* hazard their Lives, on Mineral *Experiments* in Furnaces; where tho' the Fires are not so very fierce, as those *Pliny* went to consider; yet the Fumes do sometimes prove as fatal. There are also many *Anatomists* that dote upon *Anatomy*, and making *Experiments* therein, tho' they converse with dead and stinking Carcasses (that are not only hideous Objects in themselves, but made more ghastly by putting us in mind that our selves must be such) which one would think should make it a very melancholly, and hated employment.

That great Philosopher *Pythagoras* (of the Isle of *Samos*) had such a desire after Knowledge; that he travelled into *Egypt*, and to *Babylon*, only to improve his Knowledge: It is reported in History of this famous Ancient, That he having found out the 47 Prop. of the 1st. lib. of *Euclid*. was so extream joyful of this discovery, (whereby he had improved his Knowledge) that out of gratitude, down goes a Hundred Oxen to be sacrificed to the Muses.

The famous *Des Cartes* saith, That the Pleasures of the Sense are no ways comparable to those which the Mind enjoys by Knowledge and Philosophy.

Having thus shew'd the Reader, that some Eminent Men are desirous of an *Experimental History*. And also how very inquisitive some are after Knowledge. I shall proceed to shew the usefulness of such a History in some few particulars: And

First, It conduces very much to *Natural Philosophy*; for it is certain, if we rightly weigh or consider the matter, there is really no other kind of

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Natural Philosophy, but that of *Experiments* and *Observations*: For by *Natural Philosophy*, or *Physicks*, we do mean nothing else (I think) but the knowledge of the Properties, and Affections of Natural Bodies; And this cannot be obtained (saith the Ingenious Esq; Mollineux) any other way, than by Experiment, and Observation: Can any Man (saith he) Dispute me into the Knowledge of the Magnet's Attraction, Direction, and Variation; or of the Phenomena of the Mercurial Baroscope, without Tryal and Experiment? Can any Argument prove that a little Sulphur, Nitre, and Charcoal should produce so strange and strong an Exploſion as Gunpowder, before they are actually put together and tryed? Men might have Disputed to all Eternity, before their Gibberish could discover the Use of that ordinary, despicable Substance, Iron Ore: To which, for ought I see, (as a most Ingenious Author has observed) we are beholding for all the Politure and Plenty, all the Learning, State, and Magnificence of the World, beyond the Rudeness, Wants, and Ignorance of the Ancient, Savage Americans; whose Natural Endowments and Provisions equal those of the most Polite Nations, but they wanted the Advantagious Uses of this contemptible Mineral. So that he, who first discovered the Use of this one poor Mine, or Tubal Cain, who first taught the way of working in Iron, may be deservedly celebrated as the Father of Arts, and Author of most of the Conveniencies of Humane Life.

2. A Compleat Experimental, and Observatical History, will be of great use to Anticipate the loss of many rare and useful Experiments, Inventions, and Arts, of which we shall give some few Instances: If any Invention, or Useful Experiment, be engrossed by one Man, it may so happen, that it may cause much hurt to Mankind: As for Instance, if any certain Remedy for an Epidemical Disease, were suffered to be Monopolized by one Man, there would be great Swarms swept away, which

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which might otherwise have been saved, had it been known to more. We shall Instance in that of the Sweating Sickness, in the 1st *Hen.* 7. The Medicine for it was almost infallible; but before that could be generally Published, it had almost dispeopled whole Towns. If the same Disease should have returned, it might have been again as destructive, had not the *Lord Bacon* taken care to set down the particular Course of Physick for it, in his History of *Hen.* the 7th, and so put it beyond the possibility of any Private Man's invading it. This (saith the Reverend Bishop of *Rochester*) ought to be imitated in all Sovereign Cures of the like nature; and we do design to perform it (God willing) if we continue our *History of Experiments*: By which means, all such dreadful Casualties will be prevented.

And then, as to Arts and Inventions, it is a general Tradition, That we have lost several; for instance, First, That Famous *Invention* (of *Archimedes*) the *perpetual Motion*: Secondly, *perpetual Lamps*; Thirdly, Making of *Glass Malleable*; Fourthly, Making of *Stones* for Building fusible, so that they may be cast into any Form; Fifthly, The Art of *Turning Statues*; Sixthly, Making of *Incombustible Cloth* of *Lapis Amiantus*; Seventhly, The Art of Dying of the *Tyrian Purple*; Eighthly, The making of *Mosaick-Work*; Ninthly, *Painting of Glass* according to the Method of the Ancients; and many more, which you may find mentioned in *Pancirollus*, and his Learned Commentator, *Salmuth*. A Catalogue of which, if it were made Publick, it might prove very useful, to excite some Ingenious Wits, in this inquisitive, Age to retrieve them again; for since such things have been actually done by Men, it's not impossible to be done again; and therefore, I see no reason to doubt, that it may be discovered a new. Some of these fore-cited things, have been in some measure, re-invented (if we may so speak) but before I conclude,

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clude, this particular, I shall here add, for the Satisfaction of some that are curious and inquisitive after Ingenious and Useful Discoveries; That I hope some of these forecited Inventions are not lost: And, First, That of a *perpetual Motion* is not, if we may Credit the Monthly *Mercury* for Octo. 1699. where we have an Account, That *Monf. Moitrell* (a *French Man*) has discover'd a *Macheen*, which is always in Motion, tho' no Body ever touches it. I shall not trouble the Reader with the *Mercurys* Account of it in this Place, but refer him to the *Mercury*: And as to the Second, the Reverend Bishop *Sprat*, in the History of the *Royal Society*, saith, That the Incomparable Sir *Christoph. Wren* has found out perpetual, or at least, long lived Lamps.

And as to the Third, the Honorable Esq; *Boyle*, in his *Experiments and Observat. Physicæ*, saith, That he knew a Gentleman that had seen a piece of *Glass* which was laid upon an *Anvil*, and stricken upon Seven or Eight times without breaking.

And as to the Fifth, The Ingenious Mr. *Hook*, in his *Helioscope*, mentions an Engine which he had invented to perform it. And as for the Sixth, I think that's not quite lost neither, for I remember, I have somewhere Read of a piece of Incombustible Cloth, being burnt (but not consumed) by which means it was cleansed, and that before some credible and eminent Persons of late years, but at present, I cannot remember neither the Time, Place nor Person; but I do know a *London Merchant*, whom I heard say, he had seen such a Piece of Cloth.

And as to the last, viz. Painting of *Glass*, *Monf. Blancourt* gives you the process of it: And it is really well performed by Mr. *Winches* in *Breadstreet London*: And if G.O.D grant us Life and Opportunity, we may hereafter, in some of our ensuing Volumes, add such *Observations* and
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Experiments as are of use in this curious Art.

3. An *Experimental* and *Observational History*, may and will, very much conduce to the Increase and bettering of *Trades*: For by this means, *Naturalists*, or *Physiologists*, may have a large insight into *Trades*, and so by Vertue of this Knowledge thus procured, as well as by that which they have upon other accounts, they may be enabled very much to contribute to the Improvement of *Trades*: They may do this several ways; we shall instance in some, viz.

First, by increasing the Number of *Trades*, by the addition of New ones.

Secondly, By uniting the *Observations* and *Practices* of differing *Trades* into one Body of Collections. And

Thirdly, By suggesting Improvements in some kind or other of the particular *Trades*.

But here some will object, that by thus exposing *Experiments* and *Observations*, we may injure some *Tradesmen*. To which we could give several answers to the contrary; but to avoid Prolixity, we shall only add something here, to prove that an *Experimental Philosopher* may, and will be a Benefactor to, and an Increaser of the Number of *Trades* or *Professions*. For tho' some little inconveniences may befall some *Tradesmen*, by disclosing some of their *Experiments*, to *Practical Naturalists* (or *Experimental Philosophers*) yet that may be abundantly Compensated, partly by what may be contributed to the perfecting of such *Experiments* themselves (saith the Honorable *Efq; Boyle*) and partly by the diffused Knowledge and Sagacity of *Philosophers*, and by those new Inventions (which is what we would now insist on) which may probably be expected from such Persons as delight in *Experimental Philosophy*, especially being furnished with Variety of hints from *Practices* already in use. For these *Inventions* of Ingenious Heads, do (when once grown into request)

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quest) set many *Mechanical* Hands at Work, and supply Tradesmen with new Means of getting a Livelyhood, and often of enriching themselves. As to the Discipline subordinated to the pure *Mathematicks*; this is very Evident, for those speculative Sciences have (tho' not immediately) produced their Trades that make *Quadrants, Sectors, Astrolobes, Globes, Maps, Charts, Lutes, Vials, Organs*, and other *Geometrical, Astronomical, Geographical* and *Musical* Instruments, too many to mention at this Place: Neither will we recite those many Trades, that subsist by making such things as *Mechanicians* (proceeding upon *Geometrical* Propositions) have been the Authors of: We know that whether the Excellent *Galileo*, was or was not the first finder out of *Telescopes*, yet he improved them so much, and by his discoveries in the Heavens, did so recommend their usefulness to the Curious, that many Artificers in divers Parts of *Europe*, have thought fit to take up the Trade of making Prospective Glasses. And since his death several others have had profitable work laid out for them, by newer Directions of some *English* Gentlemen, deeply skill'd in Dioptricks, and happy at Mechanical Contrivances; insomuch, that now we have a great many Shops in *London*, that furnish not only our own Virtuosi, but those of foreign Countries with excellent Microscopes and Telescopes. I know not (saith the Honorable Esq; *Boyle*) whether or no I should add, That possibly several *Experiments* of mine, have not been hitherto unprofitable to several Tradesmen: But this we do know, that this Incomparable Philosopher, who was one of the chief Glories of this Nation, did discover the usefulness of the *Toricellian* Experiment, in predicting the weather, by which it is become one of the most pleasant Instruments in the world; (saith Esq; *Molineux*) The making of which is become no unprofitable Employment to several *Mechanicks*. Also there hath been

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been a great deal of Money gained by Tradesmen, both in *England* and elsewhere, by the discovery of the *Scarlet Dye*; invented in our time by *Cornelius Drebbel*, who was not bred a Dyer, nor other Tradesman. And we dayly see the Shops of Clocksmiths and Watchmakers more and more furnished with those useful Instruments, Pendulum-Clocks, which were brought into request but a few years ago. There is also of late years many other Inventions and noble Improvements, as Weaving *Silk-Stockings*, Mortlack *Tapestry*, *Earthen-ware* of *Fulham*, *Speaking-Trumpets*, *Dipping of Cloth*, to keep out the wet, *Air-Pumps*, making of *Lute-string*, *Musical Automata*, in which very agreeable Confort is performed by *Clockwork*; a great improvement in making *Glass*, Polishing the inside of great *Iron Guns*; *Weighing of Ships* that are sunk to the bottom of the Sea, in Fishing (as they call it) for Money, lost many years ago; also *Lackering of Iron*; which endures hard blows, Fire, Spirit of Wine, and Aqua-fortis, without damage.

The second Advantage, that Trades may derive from an Inquisitive *Experimental Philosopher*, is, That by this means the several *Observations* and different Practices of Trades, whose managers want the Curiosity, the Skill, or Opportunity, to make a general Inspection into Trades, which they would find the more difficult to do (saith the Honourable Esq; *Boyle*) because Craftsmen will often be more shie of one another, and more backward to disclose the Mysteries of their Art, to one that may make a gain of it (and thereby lessen theirs) than to a Philosopher, that Inquires to satise his Curiosity, or enable himself to be helpful to them. And certainly, if so much of the known Hints, as may be gotten by the *Experiments* already dispensed among Men of several Professions, were known to one Man, tho' otherways but of common Abilities; (as my
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own Experience has in some measure inform'd me) those united Beams, which whilst they are dispers'd and scatter'd, are scarce considerable, would afford him light enough, to better most of the particular Trades, that are retainers to Philosophy. And perhaps (saith the above cited Honourable Person) it were not amiss, if there were some knowing and Experimental Persons, appointed by the Publick, to take an exact Survey of the Trades in use amongst us, and inform themselves particularly of all the Secrets and Practices belonging to them, that thus discerning the Errors and Deficiencies of each, they may rectify the one, and supply the other, partly by the Hints afford'd by the Analogous Experiments of some other Trades, and partly by their own Notions and Tryals. Of which I shall give an Instance or two.

Thus a few Ingenious French Gardiners have, of late years, usefully apply'd, to the Watering of young and tender Plants, that way of Filtration used by the Apothecaries.

There is another practice among Stone-cutters, that Cast or Mold things of Plaister of Paris, to obtain finer Powders than can be obtained by the finest Searces, it's the same as is used by Painters to wash colours: It's likewise of use to Glass-men, Potters, Chymists, Makers of Telescopes and Microscopes, and those that Cast Metal in Spaud; as likewise in making of Porcelain; and other Trades; too many to recite here.

Thirdly, It is not only by acquainting Artificers of different Professions, with one anothers Practices, that the Experimental Philosopher may further Trades, but by making Materials imploy'd by one sort of Craftsmen, serviceable to another. That a Philosopher, who has survey'd the Experiments of a great number of Trades, and compar'd them together, may do this with advantage, any one will easily grant, when they are made sensible, that without any such assistance as that of a Philosopher

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Philosopher, in whom their distinct knowledge may center, and who has skill to enlarge the Applications of them, we may observe sometimes that Tradesmen themselves can make use of one anothers productions. Of which I will give you two Instances, the one furnished me by *Lytharge*, the other by *Aqua fortis*: The former of these, viz. *Lytharge*, which is but Lead Powdered, and almost Vitrified; It serves Chymists to make Sugar of Lead; it serves divers Comb-makers to dye our Horn. It serves Painters in Accelerating the drying of their Oyl Colours and Varnishes: It also serves some Artists to counterfeit Gems. There are other Mechanick uses of *Lytharge*, which I omit to avoid Prolixity, and to come to our second Instance, viz. *Aqua fortis*, which is not used only by Refiners, but also by Dyers, Cabinet-makers, Gunsmiths, Goldsmiths, Ivory Turners, Etchers, Chymists. Founders in Brass, Bookbinders, &c.

Fourthly, It is not only by making the Practices and Productions of some Trades serviceable to others that the *Experimental Philosopher* may be a Benefactor to the Professions: For he may do it; by surveying *ained* *les* and *Observations* already received, and *belo* *ctices* already in use in each particular Trade he would improve; and then by taking notice of two things concerning it; viz. the Deficiencies and Inconveniencies that blemish it, and the Optatives that may be made about it; that he may also in the last place propose Rational (if not certain) Methods or Expedients to remedy or supply the Deficiencies, and either accomplish the Optatives, or make Approximations to it, as far as it is feizable, or as his skill reaches.

By Deficiencies and Inconveniencies, are not here meant those things, which are wanting to the absolute Perfection, which a *Philosopher* might wish to find in a Trade he considers; (for these do

do belong to the Optatives) but those which are wont to be complain'd of, and are not irremediable, or that are wanting to a more easily obtainable degree of Perfection: We will not enumerate these in particular Trades, but observe in general, that the chiefest of them seem to be such as these:

First, That Artificers may be too much confin'd to certain Materials, some of which may be scarce or dear, or ill conditioned in comparison of others, that the *Naturalist*, (or *Experimental Philosopher*) might propose. For there are many things which, he, who has *Experimental Knowledge*, of variety of Bodies, and the accounts on which they work on one another, will either quickly discern to be performable by other Materials, than those that Tradesmen confine themselves to, or probably guess to be performable by other Agents more in the Tradesmans Power, and by making Tryal of his conjectures, 'tis likely he will in a few Tryals discover what he seeks; of all which we could produce some Instances.

Secondly, That Tradesmen may be confined to certain ways of working, when perhaps it would be much more advantageous to use others proposed to him by the *Experimental Philosopher*, who may perhaps discern that what is Mechanically done, by the Artificer; may be better done Physically, *e. contra*. An Instance hereof we have of Goldsmiths; who do now Blanch some of their manual Productions, by an easie Physical Operation, which they were wont (till *Experimental Knowledge* had inform'd them) to perform by a tedious Manual Operation.

Thirdly, There may be Deficiencies also in this, That what the Artificer undertakes, is either long in doing (as in the ordinary way of Tanning, Brick-making, Seasoning of Wood, &c.) or requires more Pains, or a greater Apparatus of

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of Instruments, or else in some other way more chargeable, troublesome, or laborious to be effected, than it needs be. These kinds of Deficiencies may in very many Cases be supplied by the *Experimental Philosopher*.

Fourthly, Another sort of Deficiencies or Inconveniencies may be want of Durableness; either as to the very Being of the thing produc'd by the Artificer, or, as to the Beauty or Goodness of it.

As of the first sort (*viz.* its Being) the Decaying and Lowering of Potable Liquors, cracking of Glass in Grinding, &c. And then as to the Beauty of things, as to the fading of the Bow-Die, and the Water-colours in Limning; and the Rusting of Polished Metals. Divers of those Inconveniencies the *Experimental Philosopher* can, and hath obviated or remedied.

We shall now in a few words lay before you the *Optatives*, that may be proposed by the *Experimental Philosopher*, about the particular Trades he would improve. By *Optatives* is to be understood, all those Perfections, that being desirable, are rather very difficult, than absolutely impossible to be obtained. Of which *Optatives*, there may sometimes belong several to one Craft or Profession.

Of this sort in the *Blacksmiths* Profession, may be the making of Iron to be fusible, with a gentle heat (as the flame of a Candle) and yet hard enough for many ordinary uses. In the *Glassmans* Trade, and *Looking-glass* makers, making Glass maleable or flexible. In the *Clocksmiths* Trade, the making Pendulum-Clocks useful in Coaches, Boats, Ships, &c. In the *Brasier* and *Copper-smiths*, the making of maleable Solder. In the *Ship-wrights*, the making of Boats and Ships to go under Water. In the *Divers* Profession some small and manageable Instrument, to procure constantly at the bottom of the Sea, fresh Air,
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not only for Respiration, as long as he pleases, but also for the burning of Lights. In the *Say-Master's* Trade, the quick melting down of Ores, and cupelling them, or at least Metals, in a trice, without Bellows or Furnace. In the *Carvers* and *Joiners* Trade, the way of giving a shape to Wood in Molds, as do Plaister of Paris and calcined Alabaster.

Let me tell you (saith the Honourable Esq; Boyle) that this advantage may be derived, from the devising of such Optatives to bold and sagacious Men, that if they despair of attaining to the thing they are invited to aim at, they may at least endeavour to reach some Approximation to it. That some of these Optatives, have already been in some measure attain'd unto, we have a particular account of, in the 2d Tome, 4th Ed. of the Honourable Esq; Boyle's *Usefulness of Experimental Philosophy*.

Thus I have endeavour'd to shew the Usefulness of an *Experimental History*, and also how beneficial *Experimental Philosophy*, may be to Tradesman.

It is very apparent, that our Predecessors thought that the due management of divers Trades, was of no small concern to the publick, as may appear by those many of our *English Statute Laws* yet in force, for the regulating of the Trades, of Brick-Burners, Tanners, and divers other Mechanical Professions; in which, the Law-givers have not scorned to descend, to set down very particular Rules and Instructions.

The Honourable Esq; Boyle, was very much for Improving of Trades; and therefore he said, He often wished that some ingenious Friends to *Experimental Philosophy*, would take the pains to enquire into the Mysteries and other Practices of Trades, and give us an account; some of one Trade, and some of another, tho' the more are handled by the same Person, 'twill be *cateris paribus*, the better, not only delivering Historically, what

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what is Practiced, but also adding their own reflections, and any other thing they think fit to propose, towards the Melioration of the Professions they Write of.

Before we do conclude with our Discourse of the usefulness of an *Experimental History*, we will here add some few Instances, to illustrate the Utility and Benefit of *Experiments* and *Observations*, to the whole Race of Mankind: And First, That some (single) *Experiments* and *Observations*, have given Birth to more than one Trade. Our First Instance shall be in the flashing Exploſion, made by *Nitre*, *Brimstone* and *Charcoal*; which whilst it paſſ'd no further than the *Laboratory* of the *Monk*, it was but an *Experiment*; but when once the great (tho' in some measure unhappy) use that might be made of it, was taken Notice of, and *Mechanical* People resolv'd to make it their Profession and Business, to make Improvements and Applications of it; this only *Experiment*, gave Birth to several Trades; as namely, *Powder-makers*, *Founders* of *Ordinance*, both of *Brass* and *Iron*, and also of *Bombs*, *Granadoes* and *Petards*; *Gunners* (both for *Artillery* and *Mortar Pieces*) *Gunsmiths*; under which Name, are comprehended several sorts of *Artificers*, as *Makers* of *Muskets*, small *Pistols*, common *Barrels*, *Screw'd Barrels*, and other Varieties not here to be insisted on.

2. The *Experimental* Discovery of the *Magnet* or *Loadstone's* Vertue, by whose touch, *Needles* should attain a property to respect the *Poles*, has given occasion to the Art of making *Sea Compasses*, which in *London* is grown to be a distinct and particular Trade; for there are now, since this Discovery, diverse sorts or kinds of *Compasses*; as *Azimuth Compasses*, *Meridian Compasses*, *Variation Compasses*, *Amplitude Compasses*, *Hanging Compasses*, *Pocket Compasses*; Compasses

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passes for working in *Mines* ; and also *Dipping-Needles*, and *Compass-Dials* ; this also gave occasion (in a great Measure) to the making of *Sea-Charts*, and many other *Marine Instruments*.

We may *observe*, That there have been very great changes made in the World, by means of these Two Discoveries, *viz.* *Gunpowder* and the *Loadstone* ; for without the knowledge of the latter of these, those vast Regions of *America*, and all the Treasures of *Gold*, *Silver*, and *Precious Stones*, and much more precious *Simples* they send us (saith the Honorable Esq; *Boyle*) would have probably continued undetected : And the former, *viz.* *Gunpowder*, hath quite altered the Condition of Martial Affairs, over the World, both by Sea and Land.

It were almost endless, to enumerate all the Instances that may be produc'd, to convince the World of the usefulness of *Experiments* and *Observations* ; and therefore we shall add but a few more particulars (in the room of many which we could produce, were it absolutely necessary) and first, by observing, that *Mercury* will Amalgame with *Gold*, brought forth the *Gilders Trade*. Secondly, That Obvious and Trivial *Observation* of the quality of a Spring of *Metal*, produced the *Watch-makers Trade*. Thirdly, The *Observation* of the Vertue of *Aqua fortis*, to dissolve *Silver* and *Copper*, and not *Gold*, &c. has begot in the late Ages, the Art of the *Refiners* we now have. Fourthly, By *Observations* on the *Operations* of some *Lixiviums*, *Clays*, and a few other familiar things, upon the Juice of the *Sugar-Cane* ; has not only occasioned the adding the Culture of those Reeds to the other parts of Husbandry left us by the Ancients, but has produc'd the several Trades of *Sugar-Boilers*, or *makers of Sugar* and *Confectioners* ; not to mention the
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great Addition, the Concreted Juice of the *Sugar-Cane* brings to the *Apothecaries* Profession, upon the score of *Syrups, Conerves, Electuaries*, and other *Saccharine Medicines*: And (as saith the Honorable Esq; *Boyle*) without much impropriety, I might alledge the Art of Cultivating and gathering *Sugar-Canes*, and of ordering their Juice, as a recent Instance of the Transplanting of Arts and Manufactures. For, as I am informed by very credible Relations, there are not many Years efflux'd, since in our Memory, a Forreigner accidentally bringing some *Sugar-Canes*, as Rarities, from *Brasil* into *Europe*, and happened to touch at the *Barbadoes*, an *English Planter* that was curious, obtained from him a few of them, together with some hints of the way of Cultivating them, and using them; by which *Observations*, and the curiosity of the *English Colony*; they in a short time, so well improved them, that that small Island became, and is still, the Chief *Store-House* that Furnishes, not only *England*, but *Europe*, with *Sugars*. And this Instance, I the rather mention, because it is a very notable one; to shew, how many Hands the Introduction of one *Physico-Mechanical Art* may set on Work. Since I have had particular Opportunity, to be inform'd, That the *Negroes*, or as they call them, *Blacks*, living as Slaves upon that Spot of Ground, imploy'd almost totally about the Planting of *Sugar-Canes*, and making of *Sugar*, amount at least (saith Esq; *Boyle*) to between Twenty Five or Thirty Thousand (but from a Calculation made not many years since, there were near an Hundred Thousand, if not more) Persons; and that you may see how Lucratives in that Place this so recent Art of making *Sugar* is, not only to private Men, but to the Publick: I shall add, that by diverse intelligence, and sober Persons interested in the *Barbadoes*, (and partly by other ways) I have

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been inform'd, that there is one Year with another from that little Island (which is reckon'd but Twenty Four Miles long, and Fifteen broad) ship'd off for *England* (especially) Ten Thousand Tuns of *Sugar*, each Tun estimated at Two Thousand Pound Weight; which amounts to Twenty Millions of Pounds of that Commodity, which tho' it may seem scarce credible; yet (saith the Honourable Esq; *Boyl*) one of the Ancient Magistrates of that Island, assur'd me, that some Years it affords a much greater quantity.

Thus we may see, how by *Experiments* and *Observations*, the number of *Trades* and *Professions* are increased, within these Two or Three Ages at the most: It is certain, that they have made such a strange Alteration among the Creatures since the Creation, That if *Adam* were now alive, and should Survey that great Variety of Man's Productions, that is to be found in the Shops of *Artificers*, the *Laboratories* of *Chymists*, and other well furnished *Magazines* of Art: He would admire to see what a New World (as it were) or Set of Things, has been added to the Primitive Creatures, by the Industry of his Posterity; and all these were but the Fruits or Off-spring of *Experiments* and *Observations*.

We may observe, That many Men, by their *Experimental*, and *Observational* Knowledge, are able to perform such things, as do not only give them Power to Master Creatures, otherwise much stronger than themselves, but may enable one Man to do such Wonders, as another Man shall think he cannot sufficiently admire: As (for Instance) the poor *Indians* look'd upon the *Spaniards* as more than Men, because of the *Experimental* Knowledge they had of *Nitre*, *Sulphur* and *Charcoal*, duly mix'd, enabling them to Thunder and Lighten so *Fatally*,

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tally, when they pleased. Thus we may see, how the Ignorance of these poor *Heathens* was the cause of their Ruine; for had they known the Properties of the forementioned Bodies, when duly Compounded, it had been impossible for the *Spaniards* to have Conquer'd them, they being so Potent and Numerous a People; for had they been Masters of this one *Experiment* of the *Monks*, as well as their Enemies, it would have prevented that horrid Massacre made by the *Spaniards* in the *West-Indies*, where (as some Authors affirm) were no less than Fifteen Millions in Fifty Years space, destroyed by these barbarous Papists. Here we have a Remarkable Instance, how extrem useful the Knowledge of one *Experiment* would have been to these poor People. We shall add one more Instance, and that, of a great *Engineer's* being almost totally disappointed in a very great Undertaking and Design; and that, only by means of his Ignorance of a common and trivial *Observation*: However, it being put into his Mind, it did prevent his Ruine, which had he known before, it would have prevented that trouble and perplexity of Mind, which he laboured under for some small time. The Story which is for our present purpose, is the Relation of removing an *Obelisk*, which stands at this Day in *Rome*; it consists of one solid Stone, a kind of an *Ophite* or *Spotted Marble*, anciently Consecrated to the Honour of the Emperour *Julius Caesar*, and Erected in the *Cirque* of *Nero*; but in the Year 1586, removed into a more Eminent Place, at the vast Charge of Pope *Sixtus Quintus*, and by the admirable Skill of *Dominicus Fontanus*, an Excellent *Architect* and *Engineer*. This Stone is in height, an Hundred and Seventy Foot above the *Base*; in breadth, at the bottom, Twelve Foot; at the top

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Eight Foot ; it weighed Nine Million, Five Hundred Eighty Six Thousand, One Hundred Forty Eight Pound ; and the weight of the *Cables, Cords, Pullies,* and other moveable Instruments used in raising it, amounted to One Million Forty Two Thousand, Eight Hundred Twenty Four Pound, according to the Computation of *Georgius Drandius*. The removing and erection of this *Obelisk*, was thought to be so rare a Work of Art, that the *Engineer*, besides the great Mass of Treasure he receiv'd for a Reward from his Holiness, thereby acquir'd to himself immortal Renown, for no less than Fifty Six Learned Men, have since professedly Written, to describe his *Machines* then used, and to Celebrate his Praises, as *Monantholius* relates. But notwithstanding all their Praises, he owed no small part of his Honour to Fortune, or rather to the *Observation* of a Carter, who stood by an Idle Spectator : For the *Engineer*, a little mistaken in his Forecast of the stretching of the *Cables* and *Ropes*, found, when he came to set the Erected *Obelisk* upon the *Pedestal*, that he had not raised it high enough by Two or Three Inches, and to raise it higher with those *Machines*, to stretch, it was impossible. Confounded with Shame and Dispair by this unforeseen Failure, he began to meditate Flight, to save his Life, which he had Pawn'd to the Pope to be forfeited, if he did not accomplish this difficult Work he had Undertaken ; when as good luck would have it, out of the Crow'd of Vulgar Gazers, comes a *Carter*, and advises him to cause all his *Cables* and *Ropes* to be Wet with Water ; which being done, the *Ropes* quickly swell'd, and shortned themselves ; so that they lifted up the *Column* to a due height, and then the overjoy'd *Fontanus*, with ease, placed it upon the *Pedestal*. Thus, by the Know-

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Knowledge of a slight *Observation*, he at last accomplish'd his Design, without which, it seems, it had been impossible for him to have Effect'd it. This is an *Observation* among *Mariners*, that new *Cable* being Wet, will shrink so, that a large Ship, with the Current of the Sea, and stress of Tempests, is not of sufficient strength to retch him again. It is also an *Observation* amongst *Ringers*, that only the humidity of the Air in moist Weather, will so contract the *Bell-Ropes*, that they will be too short for them, so that they are often forced to let them out; for it is observed, that when Two or Three Men have employ'd their whole strength for some considerable time, in raising of a *Bell* of Twenty or Thirty Hundred weight, that the *Rope* will be retch'd but very little, till the moisture is again exhaled out of it. We could cite many more Instances to evince the Utility of *Experiments* and *Observations*, but we think that those we have already mentioned, are sufficient Testimonies. We shall now proceed to acquaint the Reader with the Subject of the ensuing Treatise.

And First, We have taken care to admit of nothing (as near as we could) but what is Matter of Fact, and that from none but the best Authors extant; and also from the Mouths and Manuscripts of very credible *Artificers* and *Experimenters*; for (Courteous Reader) you will here find, several *Experiments* and *Observations* which were never before made Publick: We have many more such, which may in due time (if we find this prove acceptable to the World) be also expos'd to Publick View.

And Secondly, As to the Matter of this Discourse, you will find it to consist of *Experiments* and *Observations*, relating to, First *Mechanick Trades*, Secondly, *Terreculture*, Thirdly,

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Conserving or Preserving of Bodies, and Fourthly, Ludicrous or Diverting Matters of Fact.

As to the First, viz. *Mechanical Experiments, &c.* do (in this First Volume) consist of such things as these, viz. *Observations and Experiments on Building Materials, as Bricks, Tiles, Stones, Timber, Nails, Lime, Sand, Mortar, Lead, &c.*

First, Of *Bricks and Tiles*; the *Observations* are of *Making, Burning, Closing*; the *Number* used about a Piece of Work, and the *Method* of laying, and the *Number* in a Day, by a Man, &c.

Secondly, Variety of *Observations on Mortar*, viz. the best *Sand* and *Lime*, the quantity, &c.

Thirdly, *Observations on drawing of Stones, &c.*

Fourthly, *Observations on Chusing and Burning of Lime*

Fifthly, *Observations on Chusing and Using of Sand.*

Sixthly, *Observations on the quantity, &c. of Lead and Nails, used in any quantity of Covering.*

Seventhly, *Observations on Timber*, consists of such as these, viz. on *telling, Cleaving, and Closing*, for *Uses*; *Seasoning* of the strength of some sorts, of preserving it from the *Injuries of Time, &c.*

Eighthly, *Observations and Experiments, on Dying or Staining of Woods, of all sorts of Colours, &c.*

Ninthly, *Experiments of Colouring of Wood, and Beautifying them of great Variety of Colours.*

Tenthly, of *Japanning Wooden Utensils, &c.*

Eleventhly, *Observations on Inlaying, Embossing, and Carving of Wood.*

Twelfthly,

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Twelfthly, Great Variety of Experiments and Observations on Gilding of Woods, &c.

Thirteenth, Experiments on making above Forty sorts of Varnish and Lacker, and of Lacker and Varnishing, &c.

Secondly, In Terreculture, we have these following Experiments and Observations, viz.

First, Of the Vegetation and Structure of Plants.

Secondly, Of Sowing of Seeds, &c.

Thirdly, Of Manuring, Dinging and Soiling of Land, &c.

Fourthly, Of the Propagation of Plants, by Off-Sets, Layers, Stems, Cuttings or Slips, &c.

Fifthly, Of the Raising, Planting, and Propagating of Trees and Shrubs.

Sixthly, Of Watering of Land, Herbs, Trees and Shrubs.

Seventhly, Of Transplanting or Removing of Trees, Herbs and Shrubs.

Eighthly, Of Cutting, Pruning or Lopping of Trees, &c.

Ninthly, Of Grafting.

Tenthly, Of Remedying the Diseases, Annoyances, &c. Incident to Land, Trees, Herbs or Shrubs, &c.

Eleventhly, Miscelaneo-Terracultural Experiments and Observations, as of Plants growing in the Air, in the Water, in dried Earth; altering the Colours of Flowers, Transmutation of the Species of Vegetables, Acceleration of Germination and Maturity, Retardation of Germination, &c. Melioration of Flowers, &c. Exollation of Fruit, &c.

Twelfthly, Historico-Terracultural.

Thirdly, Conservatical Experiments and Observations, of preserving Meats, Drinks, and other Liquids; small Animals, whole and Entire; also Fruits, Flowers, Roots, Leaves, Herbs, &c.

Fourthly, Ludicrous Experiments and Observations, consisting of Variety of Experiments, which tend more to Pleasure than Profit, tho

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tho' some of them are not altogether wanting in the latter, neither.

Having thus given you (Friendly Reader) a brief Account (of which you may have more ample Satisfaction in the *Contents*) of this small Treatise; which we had design'd to have made much larger (and had made large Collections for that end) but for a Reason which we have shew'd you, at the latter end of the *Mechanical* Chap. we did desist from it.

Having in the beginning of our *Prolegomenon*, hinted to the Reader, the reason of Undertaking this Design; we think it necessary, briefly to mention something of the Method which we propose to pursue in this Undertaking (if we find it proves acceptable to the World) for which we have made large Collections for all the distinct parts of it already; and had design'd to have Publish'd some of every Head or Title in this First Volume; but by the Advice of an Eminent Bookseller, who thought it might be better to give the World an Essay in the First Place, under those Four Heads or Titles; of which, this small Treatise doth consist; the which, we could have very much amplified, if it had been thought Expedient.

The Titles which we had propos'd, were to have been those following, viz.

First, *Experiments and Observations Physiological*, containing these *Paragraphs*; First, Of the pressure of the Air; Secondly, Of the Elasticity or Spring of the Air; Thirdly, Of the Comprehension of the Air; Fourthly, Of the Expansion of the Air; Fifthly, Of the pressure of *Fluids* upon *Solids*; Sixthly, Of the Compression of *Water*, &c. Seventhly, Of *Fire*, and producing it, and its Effects on diverse Bodies in *Vacuo*, &c. Eighthly, Of
Flame,

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Flame, and Duration, &c. Ninthly, Of Heat ; Tenthly, Of Cold ; Eleventhly, Of Freezing several *Liquors*, &c. Twelfthly, Of *Sounds* : Thirteenth, *Magnetical* ; Fourteenth, Of *Animals* in *Vacuo* ; Fifteenth, Of Diverse Bodies in *Vacuo* ; Sixteenth, *Microscopical*, or *Animals*, *Vegetables* and *Fossiles* : Seventeenth, Of *Colours* ; Eighteenth, Of Projecting Bodies ; *Miscellaneous*, &c.

Secondly, *Experiments* and *Observations Medical*. Paragraph First, *Physiological*, Treating of the Nature of several Parts and Juices of Man's Body, &c. Secondly, *Pathological*, Treating of the Nature, Cause, and Symptoms of Diseases : Thirdly, *Semeiotical*, Treating of the *Crisis* of Diseases, or *Prognosticks* of the Issue, or Events of Diseases : Fourthly, *Hygieminal*, Treating of the Preservation of Health, by convenient Diet : Fifthly, *Therapeutical*, Treating of the Cure of Diseases. Each of these *Paragraphs* are capable of being improved by *Experiments* and *Observations*.

Thirdly, *Experiments* and *Observations Chymical* ; Consisting of a vast Variety of *Experiments*, &c.

Fourthly, *Experiments* and *Observations Astronomical*, containing these *Paragraphs*. First, Of *Eclipses* ; of which, there are these Four Kinds, viz. First, *Lunar* ; Secondly, *Luna-Solar* ; Thirdly, *Venere-Solar*, and Fourthly, *Mercurio-Solar* : Secondly, Of the *Fixed Stars*, which are branched in these Heads. First, *Observations* on their Number : Secondly, On their Magnitudes : Thirdly, *Observations* on their Solidity : Fourthly, On their Distance ; Fifthly, On their *Parallax* ; Sixthly, *Observations* on their Appulses to the *Moon* and other Planets ; Seventhly, On New Stars appearing and disappearing : Thirdly, Of the *Planets* ; and First, Of the *Sun's Spots*, and some other Appearances,

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ances ; also *Observations* on his Magnitude and Distance ; Secondly of the *Moon's Spots*, &c. in her Face ; and also *Observations* on her distance, apparent *Diameter*, *Magnitude*, &c. Thirdly, *Observations* on *Saturn's Ring* and *Moons* Distance and Magnitude : Fourthly, *Observation* on *Jupiter's Belt*, *Satelites*, *Spots*, Apparent *Diameter*, *Magnitude* and *Distance* ; Fifthly, *Observations* on *Mars*, his Face, &c. Sixthly, *Observations* on *Venus*, her Face, &c. Seventhly, *Observations* on *Mercury*, &c.

Fourthly, *Observations* on *Comets*, vulgarly call'd *Blazing Stars*.

Fifthly, *Observations* and *Experiments Geographical* : Parag. First, On the quantity of a Degree of a great Circle upon the Earth ; Secondly, Of *Hills* and *Mountains* ; Thirdly, *Volcanoes* or *Subteraneous Fires* ; Fourthly, Of *Caves* or *Grotto's* in the Earth ; Fifthly, Of *Lakes* ; Sixthly, Of *Rivers*, and strange properties of some ; Seventhly, Of *Petrifying Waters* or *Springs*, &c. We have already made large Collections for the Four last Chap. viz. *Medical*, *Chymical*, *Astronomical*, and *Geographical* ; and there is some considerable Progress made towards the others.

Sixthly, *Observations* and *Experiments Nautical* : Parag. First, Of *Tides* ; Secondly, Of *Currents* ; Thirdly, Of *Spouts* ; Fourthly, Of the Variation of the *Compass*, &c. Fifthly, Of the Depth of the *Sea* in diverse Places, Anchorage, &c. Sixthly, Of the diverse qualities of *Sea-Water*, as to *Odors*, *Colours*, *Tastes*, breeding *Worms*, &c. Seventhly, Of *Diving* into the *Sea* ; Eighthly, Of *Winds*, and *Storms* at *Sea* ; as *Trades-Winds*, *Hurricanes*, *Tuttoons*, *Tornados*, *Elephants*, *Mousoons*, and of *Calmes*.

Seventhly, *Mechanical* ; which is to consist of all *Useful Experiments* and *Observations* relating

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lating to almost all Trades (viz. Handicrafts) as *Masons, Bricklayers, Stone-cutters, Joiners or Cabinet-makers, Carpenters, Smiths, Founders, Goldsmiths, Enamellers, Gravers, Painters, Potters, Glass-men, Glass-grinders, Mathematick Instrument-makers, Colliers, Sugar-boilers, Distillers, Forge and Furnace-Works, &c. Dyers,* and many more.

Eighthly, *Terracultural Experiments and Observations*, are to consist of such *Paragraphs* as we have a little before shewed you, that in this Vol. doth consist of.

Ninthly, *Observations and Experiments Conserva- tical*, viz. in preserving from *Putrifaction, &c.* all *Animal, Vegetable and Fossile Substances*, whether simple or Compound, &c.

Tenthly, *Experiments and Observations Ludicrous*, consist of such, as relate more to Pleasure than Profit.

Eleventhly, *Observations and Experiments Optical*: Parag. the First, To consist of such *Experiments and Observations*, as are properly so: Secondly, *Dioptrical*, and Thirdly, *Catoptrical*, &c.

Twelfthly, *Miscelaneal Experiments and Observations*, which is to consist of such, as we cannot properly rank under none of the other Heads.

Thirteenth, *Extraordinary Phenomenon*, which Word we take in the largest acception, comprehending not only those things that appear to the Eye, but also all those things that any ways manifest themselves to any other of the Senses.

These Thirteen Heads or Chapters, were, what we did at first propose, and shall (if our Design goes on) follow, or vary, according as we find it necessary or convenient.

Having given you (*Courteous Reader*) an Account of the ensuing *Treatise* (which is Compos'd of such *Experiments and Observations*, as have

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have this distinguishing Character of their Veracity, viz. That most part of the Authors, affirm them to be real Matter of Fact, from their own Experience; and we are thoroughly satisfied of the Verity of no small Number of them, from our own *Practice* and *Observation*.) It may be expected, That an Apology should be made for the tedious *Preface*, but we shall wave it, to prevent increasing the *Tedium*; tho' perhaps we may fall under the Lash of the Captious *Crittick* for it; and if we had done it, we should not have expected to have gone Scot-free; for I am very sensible, that they who Adventure to Communicate their Works to Publick View, must resolve at the same time, to have as many Censures as Lectures: For I am not Ignorant, that in Writing, any Man ever yet could please all; and therefore, it were ridiculous for us to pretend to it. To perswade the Courteous, it were needless, for they are naturally affable; and to dissuade the Captious, it were bootless, for they will not be diverted. But to conclude (*Friendly Reader*) what I have here put into thy Hands, is a Matter of no small Moment: For,

*Notional Knowledge, is of slender use;
That's best, which we to Practice can reduce.*

VALE:

An Account of the Authors, from whence the following *Experiments* and *Observations* were Collected: Besides many *Experiments* and *Observations* of the Authors own, and such as he Collected from several curious *Manuscripts*, and receiv'd from the Mouths of several Ancient and Able *Artists*; he also Collected from the following Authors, *Viz.*

- 1 **L** O R D Bacon's *Silvia Silvarum.*
- 2 Steven Blake's *Comp. Gardner's P.*
- 3 Blith's *English Improver.*
- 4 Boyle's *Usefulness of Exper. Nat. Philos.*
- 5 ———'s *Sceptical Chymist.*
- 6 ———'s *Languid and Unheaded Motion.*
- 7 ———'s *Physica.*
- 8 Burnet's *Letters from Switzerland.*
- 9 Dampier's *Voyage round the World.*
- 10 Sir Kenelm Digby's *H. of the Veget. of P.*
- 11 Dodonæus's *Historia Plantarum.*
- 12 Albertus Dura *Reviv'd.*
- 13 Mr. Evelyn's *Silva & Pomona.*
- 14 *Essay of Nat. Ex. by the Aca. Del Cimento.*
- 15 Falconer's *Art of Secret Writing.*
- 16 Nicasius le Febure's *Chymistry.*
- 17 *The French Gardner.*
- 18 Gage's *Survey of the West-Indies.*
- 19 Callendus *de Facultatibus Plantarum.*
- 20 Mr. Grew's *Anatomy of Vegetables.*
- 21 ———'s *Comparative, Anatomy of Trunks.*
- 22 Hartlib's *Legacy.*
- 23 Haughton's

- 23 Haughton's *Improv. of Husb. and Trade.*
- 24 Hill's *Natural and Artificial Conclusions.*
- 25 Mr. Hook's *Micrographia.*
- 26 Kircher's *Art. Mag. Lucis & Umbra.*
- 27 Lemery's *Modern Curiosities.*
- 28 Leybourn's *Platform for Purchaser's.*
- 29 ———'s *Pleasure with Profit.*
- 30 Mr. J. M's *Sports and Pastimes.*
- 31 Magnenus *Exercit. 1. de Tobac. & Manna.*
- 32 Monardes's *Joyf. News from the Newfound W.*
- 33 Moxon's *Mechanick Exercises.*
- 34 Ovid *de Arte amandi.*
- 35 Sir Hugh Plat's *Jewel-House of Art and Nat.*
- 36 ———'s *Garden of Eden.*
- 37 ———'s *Closet for Ladies and Gentlem.*
- 38 Mr. Plat's *Adam's Tool reviv'd.*
- 39 *Philosophical Transactions.*
- 40 Pliny's *Historia Naturalis.*
- 41 Mr. Ray's *Collection of English Words.*
- 42 Mr. Rea's *Flora.*
- 43 Mr. Remnant.
- 44 Sanderfon's *Graphice.*
- 45 Salmon *Polygraphice.*
- 46 ——— *Doron Medicor.*
- 47 Sharrock's *History of the Propagation and Improvement of Vegetables.*
- 48 Smith's *Art of Painting.*
- 49 Stalker's *Treatise of Japanning.*
- 50 Speed's *Description of England.*
- 51 Virgil's *Georgicks.*
- 52 White's *Rich Cabinet.*
- 53 ———'s *Arts Treasury.*
- 54 Bp. Wilkins's *Secret and Swift Messenger, and Mathemat. Magick.*
- 55 Sir Henry Wotton's *Elem. of Architect.*
- 56 Worlidge's *Systema Agricultura.*

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S E R I E S and O R D E R
O F T H E
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C H A P. I.

Experiments and Observations
MECHANICAL.

P R O E M.

BY *Mechanical* Experiments, &c. We would have the Ingenious Reader to understand them to be such as relate to the Practices of Artificers, or Handicrafts Men; and not that part of the *Mathematicks* which is commonly call'd *Mechanicks*; which Explains the Nature of the Leaver, the Wheel, the Pully, the Wedg, the Screw, &c. Furthermore, as these Handicraft Arts or Trades, so likewise are the Work-men themselves often stiled *Mechanicks*; a word ignorantly used amongst the Vulgar, by way of Contempt; whereas there are scarce any Faculties more necessary to Humane Life. It's observed also, that some great Scholars and Learned Disputants, do deride those Handicraft Arts; tho' at the same time they cannot deny, that it's from the Illiterate and contemned *Mechanick* (a Name of disgrace with them) that we have received the Improvements of divers useful Arts; of which divers instances might be given, if it were requisite, to vindicate their Cause against their Oponents: I shall rather add, that *Mechanicks* or Handicrafts-men, are necessary Members in any Common-wealth: For tho' Nature, which hath Armed most Creatures, sent Man Naked into the World; yet in giving him *Hands*, and Wit to use them, She did in Effect, give him Shells, Scales, Paws, Claws, Horns, Tusks, with all offensive and defensive Weapons of Beasts, Fish and Fowl, which by the help of his *Hands*, in imitation, he may provide for himself. And herein, consists the skill of the Handicrafts-Man; his Trade is such, whereby he provides things necessary for Mankind. What St. Paul saith, 1 Cor. 12. 22. of the Natural, is true also of the Politick Body; those Members of the Body are much more necessary, which seem most feeble: Mean Trades for Profit are most necessary in the State; and a House may better want a Gallery than a Kitchen. The *Philistines* knew this, when they Massacred all the Smiths in *Israel* (who might worse be spared than all the Usurers therein) and

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whose Hammers Nail the Common-wealth together, being necessary both in Peace and War. These Arts contribute to Man's Lawful Pleasure. *G O D* is not so hard a Master, but he alloweth his Servants Sauce (besides Hunger) to eat with their Meat. The *Mechanick* is also a grand Benefactor to the Common-wealth. *England* in former Ages, like a dainty Dame, partly out of State, but more out of Laziness, would not suckle the Fruit of her own Body, to make the best advantage of, and improve her own Commodities, but put them out to Nurse to the *Netherlanders*, who were well paid for their Pains. In those days, the Sword and the Plough so took up all Mens Employments, that Cloathing was wholly neglected; which Calling now employs several Thousands of divers Trades or Callings: Nay, I shall further add, that the Almighty Creator and Maker of all things, has not superseded to shew his value of Vulgar Arts. In the whole History of the First Monarchs of the World, from *Adam* to *Noah*, there is no mention of their Wars, or their Victories: All that is Recorded, is this; they lived so many Years, and taught their Posterity to keep Sheep, to Till the Ground, to Plant Vineyards, to dwell in Tents, to Build Cities, to Play on Organs and Harps, and to Work in Brass and Iron. Having said thus much by way of Proem, before I proceed to the Matter intended, I shall here acquaint the Reader with the meaning of those Terms which I shall make use of in this Chapter for the Titles of Paragraphs: I design to divide this Chapter into Five Paragraphs: The First shall be Stiled *Fabrile*; The Second, *Sartorian*; and the Third *Chymico Mechanical*; The Fourth, *Mathematico-Mechanical*, The Fifth, *Miscelaneo-Mechanical*. By the Word *Fabrile*, I would be understood, to mean all such Works or Operations as do chiefly appertain to Houses or Utensils, whether for Necessity, or Nakedness, or Recreation: By *Sartorian*, I mean, such things as Relate to Cloathing of all sorts, whether Silk, Linen, Woollen, &c. and of the Preparation of the Stuffs of its making, &c. Thickening, Colouring or Dying, and making into Form, of Folding, &c. Preserving of such Stuffs; Cleansing, Taking out of Spots, &c. By *Chymico-Mechanical*, I mean only such kind of Works or Trades as relate to the Preparation of Minerals (or other Fossils) and Vegetable Substances, &c. And also Concretes thereby, adapting them for other *Mechanical* or *Domestick* uses. By *Mathematico-Mechanical*, I mean such Experiments and Observations, as depend upon some *Mathematical* Principles, as making of Maps, Globes, and other Curious *Mathematical* Instruments, &c. By *Miscelaneo Mechanical Experiments and Observations*, I would be understood to mean such Experiments and Observations, as we cannot well Comprehend under none of the other Four Paragraphs.

P A R A G. I.

Of *Fabrile Experiments* and *Observations*.

OUR *Fabrile* Paragraph, shall commence with *Observations* and *Experiments* which have been made on Materials relating to Building: And our First Number shall consist of such as have been made on that useful and durable Material Brick.

(1.) *Bricks* (all know) are made of a Reddish Earth, (which in some places is call'd Loam) of which it is observ'd, that it is best to be dig'd up in Winter, but not to be made out all the Spring Season into *Bricks*. It is observed also, that in every Clamp or *Brick-kiln*, (besides the goodness or badness of the Earth, and the well or ill managing of it) there are Three degrees of *Brick* in goodness: The First and best sort, are those which in burning, lye next the Fire in the Kiln or Clamp; which, if they have much of Saltpeter in them, they will run, and be as it were glazed all over; these, for lasting, exceed all the rest in that Kiln, altho' the Earth and making be the same.

The Second and most general sort for Building, are those which lye next in the Kiln to those already mentioned.

The Third and worse sort, are those that lye on the outside of the Kiln, where the Fire hath not so much power as it hath over those nearer; and of those (outside Bricks) that lye on the Wind-side of the Clamp or Kiln in the time of Burning, are the worst of all; for they will moulder and turn to Dust. *Plais. for Purch. &c.* 129.

To exite the Ingenious, I shall here recite what the Ingenious Mr. *Worlidge* kints at, in his *Syst. Agric.* p. 237. relating to this Head, *viz.* It may be queried, Why (with such a Composition as Tiles are made with) might not Window-Frames, Chimney-Pieces, and Door-Cases, be form'd in Molds? That when they are burnt, may be set together with a fine Red Cement, and seem to be as one intire Piece; whereby might be imitated all Stone-work now used in Buildings, it would very well supply its defect, where Stones are scarce and dear; and also may save much Timber, which is now used in Brick Buildings, and appear much more Compleat and Beautiful, and be of more Strength and longer Continuance than Timber, or ordinary Brick, and (as I conceive) is very visible, by the *Earthen-Pipes* that have been made fine, thin and durable, to carry Water under the Ground at *Portsmouth*; and by the *Earthen Backs*, and Grates for Chimneys, made for

Sir *John Winter*, formerly at *Charing-Cross*, of a great bigness and thickness; which are evident and sufficient Demonstrations of the possibility of making Work fine, thin, and light, for Tiles, either Plain or Crooked; and for making of great Work in Molds and thro' burning them, for Doors, Windows and Chimneys. This is one of the most visible and beneficial Operations that I know in *England* to be neglected.

(2.) It hath been observed, that 4500 of (Statute) *Bricks*, will make a Rod of Wall at one Brick and a half Thick; and that a Brick-layer with a diligent Labourer, in sound and New Work (all Materials being ready) will lay about 1000 *Bricks* or upward in a Day.

It is likewise observed, that a Molder or Striker of *Bricks*, with his Attendants, can strike about 9000 of *Bricks* in a Day.

You are here to note, That by a Rod of Brick-work, is meant, Sixteen Foot and half Square, at a *Brick* and half thick: And that by Statute-*Bricks* is meant, such which are Nine Inches long, Four and a half broad; Two and a quarter thick.

Observations of Mortar, &c.

(3.) Of *Mortar*: It hath been observed about *London*, that about one Hundred and a Quarter of Lime, and Two and a half Load of Sand, will make a sufficient quantity of *Mortar* to lay a Rod of Brick-work: About a quarter of which, will lay a Square of Tiling; but for this, the *Mortar* must be dryed and better made. It hath been observed, that their *Mortar* in former Ages, was far better than ours in this Age; for when they built with small and unequal Stones, their Cement or *Mortar* far exceeded ours, as is most evident from the Ruins of Old *Monastries*, *Castles*, &c. where the *Mortar* is far harder than any of our more Modern Buildings.

It is observed, that some Masons and Bricklayers, &c. are in a great Error, to let their *Lime* slacken and cool before they make up their *Mortar*; and also to let their *Mortar* cool and dry before they use it, the contrary Method hath been observed by some, viz. to work up their *Lime* quick, and but a little at a time, that the *Mortar* may not lye long before they use it, and if it be used with *Stone*, to be sure let the *Stones* be dry for which purpose the Summer Season is to be Elested.

But for *Bricks*, If they are laid in the Winter, let them be dry also; but if they are laid in the Summer, then let them be wet; for it will quit your Cost to employ a Boy to wet them in the Summer, for they will Unite with the *Mortar* the better. *Syst. Agri.* 238.

(4.) I have heard an old Mason say, that he hath observed that if in their *Mortar*, there were any little Stones of *Lime* the

that were not run; that this would heave up Tiles in the covering of Houses, &c. And he further added, That one time above all the rest, when they were building of a Brick Stable, he did observe, that Three or Four of the upmost Course of Bricks, were heaved up by such Mortar where the Lime was not totally Slackned (or Run, as he Phrased it.) He said, therefore it was their Custome to let their Mortar lye sometime after it was made, to prevent such accidents: He saith they use Fourty Eight Bushels of Sand to Thirty Two of Lime.

He being ask'd, Whether Mortar were not strongest if it were made while the Lime was in Stone, viz while it was very new, before it was in the least Slackned? He answer'd in the affirmative; but then saith he, it doth require abundance of Water to make it into Mortar; and that's the Reason we commonly let it Run of it self before we use it.

Observations of Lime.

(5.) It hath been observed by some, that Lime made of soft Chalk, is not so good as that which is made of the hardest sort. Compatible to this, is that of Sir H. Wotton, in's *Elem. Archi.* of who says, it must be confessed, that to make Lime without any great choice of refuse Stuff, as we commonly do, is an English Error, of no small moment in our Buildings: Whereas the Italians at this Day, and much more the Ancients, did burn their firmest Stone, and even fragments of Marble, where it was copious; which in time became almost Marble again, or at least, of indissoluble durity, as appeareth in the standing Theatres and Temples; as the Temple of Romulus, for Instance, which Dr. Bivnet saw in his Travels, which has been built these 2400 Years; as also Titus's Amphitheater and Arch, which are 1600 Years. We have also here in England some Buildings of great Antiquity; I shall instance but one at present, viz. Dover Castle, which is reported to have been built by Julius Caesar, or Arviragus; but let it be either of them, it must be above 1600 Years Old.

Observation of Sand, &c.

(6.) of Sand and Water in making of Mortar: It hath been observed, that if you cannot have your choice of Lime, it's a thing of no small importance, to make choice of good Sand and Water to make good Mortar; for all Sand that is dusty, makes the Mortar the weaker; and the rounder the Sand, the stronger the Mortar, as is usually observed in Water-drift Sand; That makes better Mortar than Sand out of the Pit.

Therefore, if you have occasion for Extraordinary Mortar, wash your Sand in a Tub, till the Water, after much stirring

come off clear; and mix that with New *Lime*, and your *Mortar* will be very hard and durable. It hath been observed, that if the *Water* be foul, dirty or muddy, by so much will your *Mortar* be the weaker. *Syst. Agri.* 239.

(7.) Of a durable, cheap, and very hard *Mortar* or *Cement* much used in some Parts of *Sussex*, to make *Cisterns* for to water their Corn in for the making of Malt; and also for making of *Floors* for their Couch, or heap of water'd Corn to lye and grow, or come on, as the *Ruslick* Phrases it: These *Floors*, if well made, are very smooth and hard, almost like a Stone. This *Mortar* is made of *Lime*, (which must be good and unslacked, viz. new in the Stone) and Brook-Sand (viz. Such as is by some call'd Water-drift Sand, i. e. such as is washed down into the Rivers) and the dust of Iron from the Forge, (commonly call'd *Hamstur*;) This Anvil Dust must be beat very small, and so well mixed and temper'd with the Sand and *Lime*. With this *Mortar*, I have known several *Cisterns* made, which did as well as those which were made with *Tarris*, which is far more Chargeable. But you are here to Note, That the best Season to make these (as well as other *Cisterns*) is in the Summer, and to let them stand a Month or Two or Three, according as the Season is, that it may be thro' dry, before you use it.

New Observations.

(8.) Of another sort of *Mortar* or *Cement* for *Cisterns*; and also something observable of making *Pools* to hold Water.

It is common to lay Stone or Brick with *Tarris*, and it will keep Water very well; or you may make a *Cement* to join your Brick or Stone withal, with a Composition made of slacked, sifted *Lime* and *Linsced-Oyl*, Temper'd together with Tow, or Cotton Wool. It hath been observed, that the following Method will make *Cisterns* to hold Water very well; which is thus: First, lay a Bed of good *Clay*, and on that, lay your Bricks for the Floor; then raise the Wall round about, leaving a convenient space behind the Wall to ram in *Clay*, which may be done as fast as you raise the Wall; so that when it is finished, it will be a *Cistern* of *Clay*, Wall'd within with Brick: If this be made in a Cellar, or some damp Place, the Brick will keep the *Clay* moist (altho' the *Cistern* be empty of Water) that it will never Crack. This I have known to hold Water perfectly well in a shady place, tho' not in a Cellar. Thus, in a Garden or other places may such *Cisterns* be made made in the Earth, and cover'd over, the Rain Water being conveyed thereto, by declining Channels running into it; into which, the Alleys and Walks may be made to cast their Water in hasty Showers; also in or near Houses, may the Water that falls from them be deducted thereunto.

Parag. I. MECHANICAL.

It's *Observed*, as an usual way, to make *Pools* or *Ponds* of Water on Hills and Downs for Cattel, by laying a good Bed of *Clay* near half a Foot thick; and after a long and laborious ramming thereof, then lay another Course of *Clay* about the same thickness, and ram that also very well; then Pave it with *Flints* very well, or other *Stones*, which not only preserves the *Clay* from the tread of the Cattle, &c. but from chapping of the Wind or Sun when the *Pool* is empty. Note also, That if there be the least hole or chap in the bottom, it will never hold Water, unless you renew the whole Labour. *Systm. Agri. 105.*

(9.) Of an exceeding strong and lasting *Cement* or *Mortar*, fit for a Sun-Dial on a Wall; it hath been *observed*, that *Lime* and *Sand* (*Brook Sand* is best) and some Hair, being well temper'd with a sufficient quantity of *Linseed-Oyl*, this spread upon a Wall, will harden to the hardness of a Stone, and not decay in many Ages: Where Note, that if you cannot get *Oyl*, Scummed or Fleet Milk (as it's call'd in some Places) will do indifferent well; this will last six times as long as common Plaster, with *Lime*, *Hair* and Water. *Poligr. 2.*

(10.) Of an Excellent *Cement* for *Earthen-Pipes*, &c. A very ingenious Man, (saith *Elq; Boil*) much imploy'd about costly Water-works and Dams, assures me, That the best way to join together, and, if need be, piece and mend with a close and lasting *Cement*, the Pipes that are used for Subterranel Aquaducts, that are long to hold running Water, is to take good *Clay* (such as Tobacco-Pipes are made of) and having dry'd it, and reduced it to very fine Powder, and mixt good store of short Flocks with it, beat it up very diligently, with as much *Linseed-Oyl* as will serve to bring it to a stiff Past, almost like well kneaded Dow.

This Past, he fashions into Pipes of the length and bigness required, which tho' they will be long a drying in the Air, yet when once thoroughly dry, are very stanch and lasting. *Boil's Useful. of Nat. Phylol.*

(11.) Of an Excellent *Mortar*, *Cement* or *Lute*, which will endure the Fire. That sort of *Mortar* or *Cement* which is fitted for the Construction of *Furnices*, whether Chymical or others, is to be made with Red *Clay*, not too fat, least it be Subject to Chinks; nor too lean or sandy, least it bind not enough. This *Clay* must be wrought in Water, wherein store of Horse-dung and Chimny-soot hath been steeped, and mixt well together; by which, a Salt is Communicated to the Water, binding the *Clay*, and making it fit to abide the Fire: This hath been *observed*, to do exceeding well for Chymical Furnices. It is *observed* also, to do well in Luting of Chymical Vessels, *viz.* to arm or spread about either Glass or Earthen Vessels which are expos'd to the open Fire; but then you must add to the *Clay*, common Salt, or the *Caput Mortuum* of *Aqua-Fortis*, beaten or ground Glass, and Scales of Iron falling from

the Anvil in the Smith's Forge: By this Composition, a Lute may be made so resisting to the Fire, that it will be impenetrable to Vapours; insomuch, that it will serve instead of Resorts, when the length and violence of Flaming Fire which is usually given at the end of Mineral Operations, hath melted the Glasses. *De. Feb. Chym. 96.*

(12.) It hath been observed, that in Italy, they much use this Receipt for Plastering of their Ceilings, Floors or Walls, viz. They take fine Loam or Clay, into which they put Bullocks Blood instead of Water, well tempering and mixing it together; this, when dry, will be a very strong and binding Substance; and being well smoothed, it will glister and become very hard: The worst of it is, that it hath a smell which is a little offensive at first, but as it hardens and dries, it will lose this scent. *Ricab. 55.*

(13.) Of a Plaster wherewith Floors are made. In Nottinghamshire (saith Mr. Speed) there grows a Stone which is softer than Alabaster, but being burnt, it will make a Plaster harder than that of Paris, wherewith they Floor their upper Rooms; for betwixt the Joystes they lay long Bulrushes, and there spread their Plaster, which when it's thoroughly dry, becomes so solid and hard, that it seemeth rather to be firm Stone than Mortar; and it is troden upon without any tear or danger.

(14.) Of a Serviceable and useful Plaster for Muring [or Walling] much used in some Parts of Kent, for the external Wall of their Houses, the which they call *Rough casting*; which is commonly laid over Timber and all, in some kind of Ornamental Work, according to the Fancy of the Artificer, viz. In Rhombs (or Diamonds) Circles, Squares, or mixt of some or all of these; or some Florishes or Trail work. They first, next to the Laths, lay on a Plaster, which they work in their Ornamental Figures: This Plaster is of Lime, Sand, (Brook, or Water-drift Sand is best) Hair, and Anvil-Dust from the Smiths Forge, or Dust of the Boaring of Guns; but for want of this, Iron-Mine-Dust is used. When this Plaster is laid on, they commonly (if they can procure it) stick it full of small pieces of broken Glass, which not only makes it more durable, but also adds a Luster to it, Shimmering against the Sun-Beams, which makes it seem very pleasing to the Beholders. *per. Autho.*

(15.) Of a Profitable and cheap Mortar for Building; wherein, either no Lime, or but a small quantity shall be requisite. A Wise, Ancient, and Rich Soap-boiler, dwelling without Algate, hath, for the Encouragement of others, long since Erected a Fair and stately Building of Brick for his own Habitation; upon the good success whereof, he hath lately Built another House of no small Charge: The Mortar of which, did consist of Two Loads of waste Soap-Ashes, one Load of Lime, one Load of Loame, and one Load of Wooll, with Sand, temper'd together. *Sir H. Plat's Jewel-House.*

(16.) Another

(16.) Another Soap-boiler of good Credit and Experience, hath used only Loame and *Soap-Ashes*, temper'd and wrought together instead of *Mortar*; with which, he hath laid the Foundation, and Built the Chimneys of his Dwelling House in *Southwark*, which hath endured many Storms already, which have overturned many Tunnels of Chimneys, both New and Old, which were Built with common *Mortar*: I doubt not (saith Sir *Hugh Plat*) but that some Bricklayers and Lime-burners, will oppose this New Practice; but if these Three *Observations* are not sufficient, I can back them with Three-score more, which have been already made within the City and Suburbs of *London*; so that whoever takes a careful view of our late Buildings of Brick (especially within the Suburbs of the City) shall find great store of these wast *Ashes* employed in Building. He proceeds, and saith, by the Example of these Two Men, many others of late, have used many Hundred Loads of these *Ashes*, and would have used many Thousand Loads more before this time, but that they find this *Mortar* very Corrosive, and fretting their Hands in using it, and rough in laying, more than common *Mortar*. These Two slender Faults (of this *Mortar*, saith he) may soon be Remedied, tho' the first of these, I take to be none, but rather an Excellent quality approbate to the Nature of *Mortar*: And for the Encouragement of Builders, I shall here give them the best of Advice or Counsel, as to this Matter; which shall be such, as I dare undertake to Warrantise, upon my Credit, if carefully performed. And First, as to the roughness of it, any one that is not Blind, may see which way to remedy it; for if it be either ground or beat in fine Powder before it be mixt with the Sand, it will be brought to a smoother Temper: And as for the Charge in powdering it, I dare ingage, that the profit of a Days Labour, will answer the Charge of Three Men's Wages, in the difference of the Price of a Load of these *Ashes*, and One Hundred of Lime. Then as to the Corrosiveness, it may in some sort be avoided by wearing of Gloves, without which, they seldom lay any Bricks, to avoid the like Effects which they find in Limed *Mortar*: But for an assured Remedy (if the same be such as cannot be endured by the Bricklayers) let these wast *Ashes* be re-imbibed with Water, for a considerable time, till some part of the Salt be separated from it; and then, without question, it will be gentle enough, and much of its fretting nature taken away. He farther addeth; I will pass over the Use of them, in Paving the Streets, and laying of *Bowling-Allies* wherein many Hundred Loads of these *Ashes*, are yearly consumed in *London* and the Suburbs. *Ibid.*

Observations of White-washing.

(17.) Of *White-washing* Plaster'd Walls; It must be supposed, that the Wall is very well Plastered with fine Plaster well layed; after which, you may Whiten it with *Lime-Milk*, very clear, which I shall by and by describe. The Wall should be very well wet with Water; for all the Secret consists in the *Whitening's* not drying too fast, but rather very slowly, which gives the Lime time to fix it self, drying leisurely; and being thus managed, the Walls will neither white your Hands nor your Clothes: If there were any dirt upon the Wall, it ought to be scraped off. It will do also upon *Free-stone*, it being struck over Two or Three times; after a while (*viz.* an Hour or Two) strike it over with the palm of your Hand, and it will Polish it like Marble. *Lemer, Mod. Curios.*

Of making Lime-Milk.

(18.) The best *Lime Milk* is made after the Lime hath been a long time slacked, into which, having put a sufficient quantity of Water, it must be stirred till it make a white Froth on the top, which must be immediately taken off and kept for use. The last passing over, it ought to be with *Milk* of unslacked Lime, that the White may have the better Gloss. *Ibid.*

(19.) Of another way of *White-washing*: It must be first done over with Lime and Black, well layed by Rule and Plummet, and be rubbed over smooth, then Whiten it Three or Four times together with *Lime-Milk*: The First White must be very clear; the Second, somewhat thicker; and the Third, more, so putting to it more or less Water, as you think fit. This way may be called the best, most beautiful and quickest of all. *Ibid.*

(20.) Of a Way used in *France*, to Rub and Colour Plaster'd, Ceilings and Floors:

You must scrape it very well, then take Urine and Soot of a Chimney, or of an Oven is better; mix and dissolve it well, letting it infuse Two Days; then with a Brush, rub the Floor or Ceiling, and let them dry before you walk over them; when dry, rub them as you do Boarded Floors. *Ibid.*

(21.) For the Satisfaction of the Curious, I shall here add, the Method of making the Plaster of the Ancients, wherewith they made their Ground for that Noble Way of *Fresco* Painting, so much esteem'd by the Ancient Greeks, and since by the Romans. *Plutarch* tells us, that *Aratus*, the Great Commander under *Ptolomy* King of *Agypt*, spared the sacking of a City, purely

purely for the Excellency of *Fresco* Painting, that was upon the Walls and outside of the Houses. It hath also been much in esteem amongst the *Germans*, who had several Towns of it rarely done; which were ruined in the Wars betwixt the Emperor and the Protestants. At *Fountain-Bleau*, in *France*, is Excellent Work of this kind, done almost 200 Years ago. The *Plaster* they made of *Lime*, which was often washed till the Salt was abstracted; this was done by often pouring Water on it, which the oftener the better; this *Lime* they mixt with the fine Powder of Old rubbish Stones: This *Plaster* they laid on in clear dry Weather; but to make this Work the more durable, they used to drive into the Walls, stumps of headed Nails, about Five or Six Inches asunder; and by this means, the *Plaster* was preserved from peeling. Then with this *Past* or *Plaster*, they Plastered the Wall a pretty thickness, letting it dry; being dry, they Plastered it over again, about the thickness of half a Barly Corn, very fine and smooth; then your Colours being ready prepared, work this last Plastering over whilst it is wet, so will your Painting unite and join fast to the *Plaster*, and dry together as a perfect Compost. For this use all Earthy Colours are best, as the *Okers*, *Spanish Brown*, *Spanish White*, *Terra-vert*, and the like: Mineral Colours are naught. For this Design they used Pencils and Brushes, long and soft, otherwise the Work would not be smooth: They also observed, to let their Colours be full, and to flow freely from the Pencil or Brush. *Sand. Graph. 81. N. B.* Your Colours may be mixt with *Lime-Water*, *Milk* or *Whey*.

(22.) Of *Burning Lime*: An Ingenious *Suffex* Gentleman introduced the use of *Fern*, for Burning of *Lime*, which he found answered that end as well as Wood (the Flame thereof being Vehement) and is far Cheaper. *Coll. Eng. Wor. 193.* And why might it not serve also, to Burn *Bricks* and *Tiles*, if it were Cut in Season, and bound up when dry into Fagots fit for for the Kiln?

(23.) Of *White-washing* of Walls and Ceilings: For this purpose they generally use *Lime* incorporated with *Size-Water*: But I have heard some Ancient *Masons* commend *Fleet-Milk* [*Viz.* such as the Cream hath been scummed from] or *Whey*, and they say, it makes a better White, and more durable: *Esq; Sanderson* in's *Graphice* says, it will endure the Weather very well.

Observations of Tiles, &c.

(24.) Of *Tiles* and covering of Houses, &c. *Tiles* are made of better Earth than *Bricks*, *viz.* commonly of well tempered Clay. It's a general Observation, that those *Tiles* which Workmen call *Salmon Tiles* (which are of a Light Red-
ish

ish Colour) are not so durable as those which are of a darker Colour. The length of a Plain Tile, is usually (at London, saith Mr. Leybourn) Ten Inches and an half, and in breadth Six, and in thickness near Three quarters of an Inch: But I find this is not the usual size every where, for I have observed, that in some parts of *Sussex*, that they are (when burnt) Ten Inches long, Six broad, and about half an Inch thick. And whereas Mr. Leybourn saith, that one Tile weighs about Two Pound and an half; I found, that Eight *Sussex Tiles* weighed about Seventeen Pound, which is Two Pound Two ounces each, *Averd.* Weight. Now as to the Weight of the Covering of Houses, Men differ in their Opinions according to their different Observations; The heavier any covering is to a House (saith Mr. Worlidge) the greater is the Expence in raising the whole Frame or Building to support it, and the sooner doth it require Reparations; therefore, Healing with Lead or flat Stone (in *Sussex*, call'd *Horsham-Stone*) is not to be approved, by reason of its Weight, where Earthen Tile, Slate or Shingles are to be had. Next unto Lead or Stone, Tiles made of Clay are the heaviest; and all know are most in use. *Pan-tiles* (saith he) such as come from *Holland*, are the best and lightest Covering of any sorts of Tiles. *Syst. Agri.* 237. You shall next hear, what Mr. Leybourn hath observed as to this Matter.

(25.) Of the distance of Laths, Number of Tiles and Nails, &c. used in a Square or Yard of Healing or Covering; of its Weight, &c.

Mr. Leybourn hath observed, that in and about London, the usual distance of Laths on the Roofs of Houses, is about Three and a half or Four Inches, with a Counter Lath between Rafter and Rafter; or Two, if the Rafters stand at a very large distance. Now he hath observed, that one bundle of Laths of five Foot long, and five Hundred of Nails; or one Bundle of Four Foot and Six hundred of Nails, One Hundred and Twenty to the Hundred, at Seven Inches Gage (as the Bricklayers term it) will Lath a Square, *i. e.* Ten Foot every way, which will require about 665, or 670 Tiles; and one Tiler will cover such a Square in a Day. But as to the Weight, Mr. Leybourn differs from Mr. Worlidge; for whereas Mr. Worlidge saith, that Lead is the heaviest Covering, Mr. Leybourn demonstrates the contrary, thus; for saith he, One Foot of Lead (if New) will weigh Eight or Nine Pound; but if old, less, as Six or Seven. Now suppose the most, that one Foot weigh Nine Pound, the Yard Square will weigh Eighty One Pound, and a Square will weigh Nine Hundred Pound: Now he saith, that Sixty Tiles laid at Seven Inches Gage, will Cover a Yard; which at Two Pound and half *per Tile*, amounts to One hundred and fifty Pound; and at Six Hundred Sixty Five Tiles to the Square, the Square will weigh One Thousand Six Hundred Sixty Two Pound: Here is nothing considered for the weigh of the Mortar, which is no small matter; but we did
not

not allow any thing in the *Lead* Covering for Soder; But tho' *Lead* be the lightest Covering, yet *Tiles* are the Cheapest. As to the quantity of Mortar used in a Square of Healing or Tiling; *V. Num. the 3d, Plat. for Birch*. I had it for an *Observation* of a Country Bricklayer, that betwixt Three and Four Bushels of *Sand*, and Two Bushels of *Lime*, would make a fit quantity of *Mortar* for a Square of Tiling. This Bricklayer also told me, that he did approve of heavy Covering to Houses, &c. supposing the Building fit to support it: For, saith he, I have *observed*, that High Buildings that have been Covered with *Pantiles*, which is a very light Covering, hath been very subject to be shaken and rocked to and fro by the Wind, and thereby the *Tiles* have been loosned, and the Rain, hath by this means, found vents into the Buildings; altho' *Pantiles* be accounted very good Covering; (which we may *observe* in their Covering the flat Roofs of low Sheds, &c. with them, where they keep out wet very well.) Now, saith he, a heavy Covering to a Building (especially a *Timber* one) is a great means to steddify and fix a Building; thereby enabling it to resist the Violence of Turbulent Winds. *Newt. Obser.*

Observations on drawing Stone.

(27.) Of drawing *Stones*, or breaking *Rocks*: It hath long been, and still is (saith *Esq; Boil*) in many Places, a matter of much Trouble and Expence, as well of Time as Money, to cut out of *Rocks* of *Alabaster* and *Marble*, great Pieces, to be afterwards Squared or Cut into other shapes; but what by the help of divers Tools and Instruments, cannot in some Quarries be Effected, without much Time and Toyl, is in other Places easily and readily performed (as I have *observed*) by making, with a fit Instrument, a small perforation into the *Rock*, which may reach a pretty way into the Body of it, and have such a thickness of the *Rock* over it as is thought convenient to be blown up at one time; for at the farther end of this perforation (which tends upwards) there is placed a convenient quantity of Gunpowder, and then all the rest of the Cavity being fill'd with Stones and rubbish strongly rammed in (except a little place that is left for the Train) the Powder, by the help of that Train, being fired, and the impetuous Flame being hindred from expanding itself downwards, by reason of the newly mentioned Obstacle, concurring with its own, tending another way, displays its force against the upper parts of the *Rock*; which in making its self a passage, it cracks into several Parts, most of them not too unwildy to be manageable by the Workmen.

And

And this way of Blowing up Rocks, a little varied and improved, some Ingenious Acquaintance of ours, imployed by the Publick to make vast Piles, have lately (as I received the account of themselves) blown up or scattered, with a few Barrells of Gun Powder, many Hundred, not to say Thousand Tuns of common Rock. *Use of Exper. Phyl.*

Now we are Treating of *Stone Quarries*, I will here add, an *Observation* of the Reverend *Gilbert's*, Lord Bishop of *Sarum*: It's not a common, but a rare and Curious Piece of *Mechanick Work*.

(27.) Of *Pots*, which are turned out of *Stone*: There is a sort of *Pots* of *Stone*, that is used not only in all the Kitchens here, (which was the Town of *Chavennes*) but almost all *Lombardy* over, call'd *Lavege*. The Stone feels Oily and Scaly, so that a Scale sticks to ones Finger that touches it, and is somewhat of the nature of *Slate*; there are about Three Mines (or Quarries) of it known in these Parts; one near *Chavennes*, another in the *Valteline*, and a third in the *Grisons*; but the first is much the best: They generally cut it in the Mine, round, of about One Foot and an half Diameter, and about One Foot and a quarter thick; and they work it in a Mill, where the Chizzels that cut the Stone, are driven about by a Wheel that is set a going by Water, and which is so ordered, that he, who manages the Chizzel, very easily draws forward the Wheel out of the course of the Water: They Turn off first the outward Coat of this Stone, till it is exactly Smooth; and then they separate one *Pot* after another by those small and hooked Chizzels, by which they make a Nest of *Pots* all one within another; the outward and biggest being as big as an ordinary Beef-Pot; and the inward *Pot* being no bigger than a small Pipkin; these they Arm with Hooks and Circles of Brass, and so they are served by them in their Kitchens. One of those *Stone Pots* takes heat, and boils sooner than any Metal; and whereas the bottoms of Metal Pots, transmit the heat so intirely to the Liquor within, that they are not insufferably hot; the bottom of the *Stone Pots*, which are about twice so thick as those of Metal, burns extreamly, it never cracks, neither gives it any sort of tast to the Liquor that is boil'd in it; But if it falls to the Ground it is certainly broke, for it is very brittle; yet this is repair'd by patching it up, for they piece their broken *Pots* so close, tho' without any Cement, by sowing with Iron Wire the broken parcels together, that in the holes which they pierce with the Wire, there is not the least breach made, except that which the Wire both makes and fills.

The Passage to this Mine (or Quarry) is very inconvenient, for they must creep into it for near half a Mile, through a Rock that is so hard, that the Passage is not above Three Foot high; and so those that draw out the *Stones* creep all a-
long

long upon their Belly, having a Candle fastned to their forehead, and the Stone laid, on a sort of Cushion made for it, upon their Hips: The Stones are commonly Two Hundred Weight. *Let. from Switz. 94, &c.*

Now we are discoursing of Stones, I will here adjoin the Method of Polishing Marble, which may be useful to such as Live in the Country, and cannot easily procure a Work-man to Polish Marble Hearths, Chimney-Pieces, &c. which are grown dull with using, &c.

Of Polishing Marble.

(28.) To Polish Marble that hath lost its Gloss by long standing or use, &c. You must first, with a piece of Sand-Stone, Waterdrift Sand and Water, rub your Marble till you see it is free from Asperities or Scars; then next, work it yet smoother, with a Clout wet with Water and dipt in the Powder of Emery; when you have thus brought it to be very terse, you must Polish and rub it well with fine Linen Rags wet in fair Water, and dipt in the Powder of Putty; this being done, clear it up with clean Linen Rags, and 'twill have a Gloss almost like a Mirour: This Observation I had from a Stone-Cutter who I saw do several pieces of Marble, which were old Chimney-Pieces and Hearths; and when he had thus new Polished them, then they did look exceedingly well. Of him, I did also learn the ensuing Observation.

(29.) Of a Cement for Marble Chimney-Pieces, &c. Take the Powder of calcined Plaster of Paris, mix it with fair Water, till it be of such a consistence as Batter is commonly made; let this be applied to the Stones, and immediately let them be fix'd in their due Places, for it dries in a moment, and then you cannot stir the Stones, if they are not fix'd right, without a great deal of trouble: You must also take especial Care in setting the Stones one upon another, that you set them down exactly (as near as may be) with the Superfecies Parallel; for if the Edges are never so little Squat, they will crumble off and deface the Work, by spoiling the Joints. *Newt. Observa.*

Having laid before you such Modern Observations as I have at present by me (which I hope in time, I shall much enlarge) relating to Bricks, Tiles, Mortar, Lime, Sand, &c. I had thought to have proceeded next to Observations on Timber; but (partly) by the perswasion of some Friends, and for some other Reasons, I shall add what some of the Ancients, as Pliny, &c. have observed, as to those matters; hoping thereby to excite the inquisitive Heads of our present Age, to a more nice inquiry into these Matters; by which means, we may in time

time expect to see those *Ancient Observations* confirmed, or else exploded; either of which may prove useful to the World. Another Reason which I had for this doing, was, because the Works of *Pliny* (and some other of the Ancients) were large, and hard to come by; by this means, I am in hopes, I shall satisfie (in some measure) such as have desired to know what the Ancients had written on these Subjects.

Of Bricks.

(30.) It's an *Observation* of *Pliny's*, that to make good *Bricks*, they ought not to be made of any Soil that is full of Sand and Gravel; but of a greyish Marle or whitish Chalky Clay, or at leastwise a redish Earth. The best Season (saith he) to make *Bricks* or *Tile* is in the Spring, for in the Summer they are apt to be full of Chinks or Crannies; but saith he, if you would have good *Bricks* for Building, they ought to be Two Years old at least: Then as to their size, he says they had three sorts; the ordinary sort was One Foot and half (*Roman Measure*, which is something less than the *English*) and in breadth, One Foot; the second sort was Three Foot; and the third sort Three Foot Nine Inches; they were all of one breadth, viz. a Foot. The smaller sort were used in Private Buildings, and the larger in Publick. *Plin. Nat. Hist.* Vol. II. 555. I must not here omit (saith Sir *Henry Wotton*) while I am speaking of this Part (of Building) a certain form of *Brick* described by *Daniele Barbara*, Patriarch of *Aquila*, in the largest Edition of his Commentary on *Vitruvius*. The Figure which he there commends, is a Triangle; every side a foot long, and an Inch and half thick, which he highly commends for many good qualities; as first, that they are more commodious in the Management; secondly, of less Expence; thirdly, of a fairer Show, adding much Beauty and Strength to the *Mural Angles*, where they fall gracefully into an indented Work: So that I wonder (saith Sir *Henry*) that we have not taken them into Use, being propounded by a Man of good Authority in this Knowledge; but all Nations are apt to start at Novelities, and are naturally wedded to their own Molds. *Elem. Archi.* 14.

Of Lime.

(31.) *Cato Censorius* in his *Observations* doth not approve of *Lime* that is made of divers sorts of Stones, or of various Colours; and to speak the truth (saith *Pliny*) white Stones are better to make *Lime* than hard ones; and it is better for *Masons Use*: Some observe, that *Lime* made of hollow and Porous Stones, is best for Parging or Plastering of Walls.

Lime

Lime made of Stones which are digged out of the Ground, is far better than that of Pebbles gather'd from the River side. That which some make of Mill-Stones, is very good, because it is more Fat and Glutinous than any of the other sorts. *Plin. Vol. 2. p. 594.*

Of Sand.

(32.) It is an *Observation* of *Pliny's*, That there are Two Species of *Sand*, one sort is digged out of the Pits, and this requireth a quarter part of *Lime* to be added to it, in making it into *Mortar*: A second sort is found by the River sides, or the Sea shore; and this must have one third part of *Lime*; and if there be one third part of Pot-sheards beaten to Powder and add to it, it will be much the better *Mortar. Plin. Vol. 2. 594.*

Of Mortar and Plaster.

(33.) *Pliny* observes also, That *Mortar*, the older it is, the better for Building; for he saith, it was also accounted so by the Ancients; for (saith he) in the Old Laws, which provided for the perpetuity of Houses, in Ancient times, we find it expressly set down, that the Undertaker to Build a House at a certain Price, shall use no *Mortar* under Three Years of Age; and this was the reason (saith he) that in those Days, a Man should not see any Rough-cast or Plastering to rise in Blisters, and be subject to peel off, as it doth now-adays: And the Truth is, unless there be laid upon VValls, three Coats or thickneses of *Mortar* made with Sand and Lime, and Two Courses over them of other *Mortar* made of Marble-Grit and Lime temper'd together, the VValls will not be Permanent, nor Fair and Resplendent, as they ought to be; and where Walls are dampish, and given to sweat, by means of a Salt Humour, or Salt Peter which is the cause of it; it were a good way to lay a Ground under it of *Mortar*, made of the Powder of Pot-sheards and Lime.

As for the *Mortar* made of Marble-Grit and Lime, the way to know whether it be well made, is this: If it will not stick to the Shovel, but will come out of the heap neat and clean again, it is then good; but it must be the contrary in VVhiting and Fretwork; the Lime being soaked and wet in VVater, ought to cleave, or stick like Glew. *Plin. Vol. 2. 594.* The *Sheards* of Potters Vessels being beat into fine Powder, and mix'd with Lime, will make a very strong and durable *Mortar* or *Cement. Plin. Vol. 2. 554.*

Of Stones.

(34.) It's an *Observation* of *Pliny's*, that *Stones* which are found in *Rivers*, are not good for *Building*, for they seem always to be relenting, and sweat forth moisture; but such *Stones* as these, and all others which you question whether they are durable, the only Remedy I know, is, to dig them out of the *Ground* or *Quarry* in the *Summer*, and let them have *Two Years* seasoning, by letting them lie abroad exposed to all *Veathers*, before they be employ'd in *Buildings*; and such as have by these means caught hurt, may serve well enough in *Ground-work*, and for *Foundations*, where they are not exposed to the *Veather*; and that which remains sound, you may be bold to employ in the open *Air*, yea, on the outside of *Buildings*. *Plin. Vol. 2. 593.*

Having thus briefly laid before you some *Observations* of the *Ancients*, I shall now proceed with *Modern* ones again; and our next *Observation* shall be

Of Timber.

(35.) Our First *Observation* of this kind shall be in felling it. In former Ages, they observed to fell *Timber* always in the *Winter*, when there was least *Sap* in it; but now (the more the pity) by reason of the scarceness of *Oak* (the principal *Timber*) our Statutes oblige us to fell it in the *Spring*, for the conveniency of having the *Bark* for the *Tanners* use. It would be no small conveniency to the Nation, were there some real way found out of *Tanning* *Leather* without so much *Bark* (as the Honourable Mr. *Charles Howard*, has most ingeniously offer'd) for by this means we might have a better Opportunity to fell our *Timber* in the *Winter*; for it is a general *Observation*, That that *Timber* which is fell'd in the *Spring* or *Summer* when the *sap*, is very *Turgid*, is very subject to shrink, chap, and decay much more, and sooner than otherwise it would do; which inconveniencies in *Square Timber*, are not so apparent or visible, as in *Plank* or *Board*, or such like broad and thin Work. *Silv. 90.*

Secondly, having fixed upon the time, and the *Trees* you are resolved to fell; it is observed to be a very good way, to disbranch the *Boal* of all such *Arms* and *Limbs* as may endanger it in it's fall; wherein, *Forecast* and *Skill* often prevents *Danger* and *Spoil*; for many Excellent *Trees* have been spoiled for want of this necessary *Observation*; and therefore in *Arms* of *Timber* which are very great, chop a *Nick* under it close to the *Boal*, and so meeting it with the downright *Strokes*, it may be Cut without splitting. It's also a necessary *Observation* in *Sawing* down of *Timber*, (if it be large) First

to chop a passage thro' some Claw, and there to begin to Saw ; for by this means the Claw will hold it till you have Sawed the Tree afunder ; by this means (choping the Claw off) you may not let it go down till you please. By this Method, Trees are prevented from being Rift or Cleft, or Pith-drawn, as some call it, by falling too soon, *viz.* before they are Sawed afunder.

(26.) *Of the Crinckles or Rings which are seen at the end of Trees when Saw'd off, and also of the lying of the Pith in Trees, which will be of Use in chusing of Trees to Fell for Cleaving.*

It's a general *Observation*, That the *Trunk* or *Bough* of a *Tree* being Cut Transversly Plain and Smooth, sheweth several Circles or Rings, more or less orbicular, according to the External Figure, in some Parallel Proportion, one without another, from the Center or Pith of the *Tree*, to the inside of the Bark, dividing the whole into so many Circular spaces: These Rings are more large, gross, and distinct in Colour and substance, in some kind of *Trees* ; generally in such as grow to a great Bulk in a short time, as *Fir*, *Ash*, &c. smaller or less distinct, in those that either not at all, or in long time grow great ; as *Quince*, *Holly*, *Box*, *Lignum Vitæ*, *Ebony*, and the like sad coloured and hard *Woods* ; so that by the largeness or smallness of the Rings, the quickness or slowness of the growth of any *Tree*, may, perhaps, at certainty be estimated.

These spaces are *observed* to be manifestly broader on the outside than on the other ; especially the more outer to a double Proportion, or more, the inner being near an equality.

It is asserted, that the larger parts of these *Rings*, are on the South and Sunny side of the *Tree* (which is very Rational and probable) insomuch that by cutting a *Tree* transverse, and Drawing a Diameter thro' the broadest and narrowest Parts of the Rings, a Meridian Line may be described. *Juvitias Silva.*

But as to the preceding Matter, the Place of the *Trees* growth must be considered, for if it do not grow in an open Field. or else in a Wood, where the Circumjacent Air doth equally surround it, the Effects will prove quite otherwise: For the proof of which, I shall add the following *Observations*, which were made by an *observing* Mechanick.

Saith he, We *observed* a *Tree* that grew on the Easterly side of a Wood, which was about One Foot Diameter, at Five Foot and half from the Ground ; that the Sap and Rind on the Easterly side, which was the Sunny side, and was very near the Hedge, which was very near *Meridional*, I say (saith he) that the Sap and Rind on the Easterly side, was Two Inches and an half, but on the West or Shady side, it was but seventh Eighths of an Inch thick ; and the Pith lay but Two Inches

and an half from that Shady side ; and Nine Inches and an half from the Sunny side. The shady side (saith he) was next the Wood which was West; and on the South side grew another Tree not above One Foot and half from him. We did observe (saith he) that this Tree did cleave very badly.

We did observe another Tree that stood on the South-East side of a Wood, out against the plain Land, the Sap was broadest, and the Pith farthest from that side which was next the plain Land: This Tree did also cleave very badly.

He saith, We did Fell another Tree in the midst of a Wood, which we did observe that its Pith lay very near the middle or Center, and the Sap was very near of an equal Thickness all round; but rather something most towards the South.

We did observe another Tree (saith he) which we Fell'd, that stood in a Wood; but there came in a Lane, so that the Tree was expos'd to the Sun on the South East side, and the Pith lay Nine Inches from this side. and but Five from the other, at Five Foot above ground; where we did Cut him off, where he was very sound, as also at the But end: But he had a Bunch or Swelling Extuberance near the Ground on the North-East side, which was close by the Lane; and so I suppose it might proceed from some Bruise, which was grown over a hollow Hole; this was fill'd downward with Dirt or putrified Wood; up above it, farther up in the Hole, we found fresh Moss, tho' not perfectly Green; the Hole was largest downward, running up conically about four Foot.

We did observe another Oak (for such all the rest were) that grew at the Tail of a Pond, on a wet and hardish Gravel, to cleave very freely and straight, but the Tree was dead; I do suppose he might be over cloy'd with moisture, and that kill'd him.

Another Oak we observed, growing by a Deep, VVet Ditch-side (that came from a Pond) that the Tree when Sawn down, the Pith lay within Four Inches of that side of the Tree next the Ditch, and Eleven Inches from the other.

VVe made an Observation on another Oak that grew under the Boughs of a great Beech, on the N. VV. side of him, as also on the N. VV. side of a Shade: VVhen the Tree was down, and Cut off about a Foot above the But-end, we did observe that That side which was next to the open Field (viz. N. VV.) was Eight Inches from the Pith, and the other was but Five.

VVe observed another Oak that grew on a little Bank (in a kind of a Copse) just by a Pit of VVater; when he was down, we found that the Pith at the But-end was but Five Inches from the Surface on that side next the VVater, and it was Ten Inches from the opposite one; tho' both were equally expos'd to the Sun and Air; and when we had Cut him off at Sixteen Foot from the Butt, there the Pith lay but Three Inches from the side next the VVater, and Six from the

the other; this *Tree* Cleft pretty free, tho' the Pith were crooked.

VVe observed an *Oak* that grew on the N. E. side of a VWood, that his Pith grew nearest to the VWood side, and by consequence, farthest from the open Field, which was N. E. from the *Tree*.

VVe observed another *Oak* that grew on the East side of a Hedge, where was a Row of *Trees* to the VWest of him: VVhen the *Tree* was down, we found that the Pith at the Butt-end was abundantly nearest to the East side, and at Ten Foot above the Butt nearest to the VWest by abundance. The Cause whereof, I conceive to be thus (saith he) That altho' he had the free Communication of the Air on the East side, (as being next the Field) so likewise had it on the VWest below; and what is more, the refreshing Beams of the Sun from the South VWest and VWest, betwixt the Bodies o' the adjacent *Trees*, there being little or no Hedge to hinder; whereas, on the contrary, the Tops and Boughs of the adjoining *Trees* were so Contiguous, that they hindred the free access of the Sun and Air on the VWest side towards his Top.

VVe observed Two *Oaks* that grew on a kind of Rocky Bank, which tho' they promised to the Eye to cleave well, yet they proved quite the contrary, viz. very tough and ill.

VVe did observe an *Oak* (that grew in a VWood) that the Pith, where the *Tree* was Cut off, Ten Foot from the Butt, lay Eight Inches from the South East side, which side was most exposed to the Sun and Air; and but five Inches from the North VWest side, which was not so freely exposed.

VVe did observe another *Oak* that grew on the South VWest side of a VWood, and he grew on a Bank just in an open Field, the Field and Bank were both on the South VWest side of him: I say, we did observe when he was down, that his Pith was but four Inches from the North-East side, and Fourteen Inches from the South VWest, at the Butt-end, and at Nine Foot and an half above the Butt, it was Four Inches from the North-East, and Nine from the South VWest: The Reason (saith he) I conceive to be, because growing on the side of a Bank, he drew all his Nourishment from that side where he had most Roots (viz. South VWest) and the warm Rays of the Sun, and free access of the Air. This *Tree*, tho' cleft well. Thus, by these Observations of a Country Mechanick (in whose Phrase I have penn'd them) a Meridian cannot always be found by the Circles or Rings on the stump of a *Tree*. You may hence also observe, that such *Trees* whose Piths lie so far from the Center, very rarely cleave well, and therefore ought not to be chosen for that use; and which you may suspect to be such, I think these Observations will inform you.

Having said something of Felling of *Timber*, we shall now proceed to add some *Observations* of Seasoning it.

Of Seasoning Timber.

(37.) Some generally *observe* to lay up their *Timber* very dry, in an Airy Place (yet out of the VVind or Sun) and not standing upright, but laying along one Piece upon an other, interposing some short *Blocks* between them; to preserve them from a certain Mouldiness which they usually Contract while they Sweat. Some always *observe* to submerge their New Sawn *Timber* in a Stream of running VVater for about a Fortnight, and then take it out, and let it Season in the Shade; which is a good way for hasty Seasoning of Boards, &c. *Evel. sil.* I have known some Season *Timber* in haste, by Boiling in VVa-
ter; for Ballisters and such uses, I have known it Practi-
sed.

Some *observe* for thoroughly Seasoning of *Boards* for *Floors*, &c. they take them and rough-Plain them over, that they may set them by to new Season; for it hath been *observed*, that if they have been Seven Years Seasoned before, when they come to be new Plained over and Shot, they will shrink, for want of Practising this *Observation*, together with *observing* to make choice of a dry Season to lay the Floor in: I say, I have known a large and curious Chamber-Floor of a Gentlemans quite spoiled; for there (I really believe) was not one Joint in the Room, which was not shrunk open a quarter of an Inch; many of them were more; tho' the *Boards* were more than Seven Years Seasoned; but they were laid down in the Winter in a wet and Foggy time; and all *Timber* will swell with the Humidity of the Air, tho' never so old. And therefore, to prevent it in some measure; some generally *observe*, when they have rough Plained their *Boards* to set them by for to Season, which they do thus: They lean them one by one an end assant, with the Edge of the *Board* against a Bank (or Pearch as some call it) somewhat above the height of half the *Board*, and set another *Board* in the same posture on the other side of the Bank, so that above the Bank, they Cross one another; then on the first side they set another *Board* in that Posture; and on the second side another; and so till the whole Number of *Boards* are set an end: Being set in this Posture, there remains the thickness of a *Board* between every Two *Boards*, all the length but just where they cross one another, for the Air to pass thro' to dry and shrink them, against they have occasion to use them: But they *observe* to set them under some covered Shed, that the Rain nor Sun comes not at them; for if the Rain wet them, instead of shrinking, they will swell; or if the Sun
shine

shine fiercely upon them, it will dry so fast, that the Boards will tear or split. *Mechan. Exer. 155.*

(38.) Of choosing *Timber* to Cleave well, when it is ready Fell'd.

It's an *Observation* of an Experienced *Timber Broker*, That *Oaken Timber* will certainly cleave well, when after it has been Fell'd a while, it looks Yellow on the Butt-end, and doth not tear and open with the heat of the Sun. *J. B's Obser.*

(39.) Some *Observations* of Cleaving out of *Timber*.

An *observing Country Mechanick* tells me, he hath *observed*, that about Ten or Twelve Foot of good cleaving *Timber*, will make about a hundred of *Pales*; and that a Tun of good cleaving *Timber*, will make about Seventy or Eighty *Rails*; but a Tun of indifferent *Timber*, will not make above Sixty; if bad, not Fifty perhaps. He says, also, That about the same proportion, will hold for *Posts*. And as for *Laths*, he *observes*, That a Tun of good *Timber* will make about Thirty hundred: but if it be but indifferent, not above Twenty five or Twenty six Bundles or Hundreds.

(40.) Of the Strength of some sorts of *Timber*.

The forementioned *Mechanick*, made several *Experiments* to find the Strength of *Timber*; he having provided himself with several pieces of *Ash* and *Fir*; he having provided also, an Instrument on purpose, by which he could *observe*, not only how much would break a piece, but also how far it bent before it broke; and that in any Position, *viz. Horizontal*, or *Perpendicular*, *viz.* The weight being applied on the top, when it stands an end; or in the middle, when it lies *Horizontal*.

He saith, he did *observe*, That a piece of *Ash* of half an Inch Square, and Twenty four Inches long, was broken when it lay *Horizontal*, with about Thirty two Pound *Averd.* and it bent about four Inches before it broke. A piece of *Fir* of the same size and length, and in the same Position, was broken with Forty two Pound *Averd.* and bent but One Inch and a quarter before it broke. A piece of *Ash* of half an Inch broad, and one Inch thick, and Twenty four Inches long, was broken (when placed *Horizontal*) with about a Hundred Thirty Four Pound *Averd.* and bent One Inch and an half: But a piece of *Fir* of the same size and length, and in the same Position, was broken with One Hundred and Sixteen Pound *Averd.* and bent but Three quarters of an Inch.

A piece of *Ash* of an Inch broad, and half an Inch thick, being placed in a *Horizontal* Position, was broken with Eighty Seven Pound *Averd.* it bent Four Inches; the length was Twenty Four Inches, as before. A piece of *Fir* of the same length, breadth, and thickness, and in the same Position, was broken with Fifty Seven Pound *Averd.* and bent One Inch and a quarter. A piece of *Ash* of an Inch Square, and Twenty Four Inches long, being placed in a *Horizontal* Position; he *observed* was broken, with about Three hundred pound *Averd.* and bent about an Inch and three quarters. But a piece of *Fir*

of the same Square and length, and lying in the same Position, was broken with Two Hundred and Thirty Pound *Averd.* and bent before it broke, one Inch. *N. B.* That by the breadth of a piece he means (or would be understood to do so) that side to be the breadth of a piece, which lies Parallel to the *Horizontal*; and that to be the thickness which is vertical to it; so that when he speaks of breaking a piece of half an Inch broad, and an Inch thick; you are to note, That piece was broken edg-wise. *Et Contra.*

He also procured two pieces, one of *Ash*, the other of *Fir*; each piece was two Foot long, an Inch square in the middle, and half an Inch at each end; so that each piece consisted of two frustums of two *Quadrangular Pyramids*. The *Ash* one being layed in a *Horizontal*, it was broken with an Hundred ninety five pound *Aver-du-pois*; and bent before it broke, two Inches. The piece of *Fir* placed in the same Position, was broke with an Hundred and Eighty pound *Aver-du-pois*, and bent also two Inches. He also made *Experiments*, to find the strength of six pieces of *Ash* and *Fir*, when they stood an end; where he *observed*, that a piece of *Ash* of a quarter of an Inch square, and twenty four Inches long, was broken with Twenty one pound, and bent six Inches; and the *Fir* of the same size and length, and in the same Position, was broke with twenty pound, and bent also six Inches. He *observed*, That a piece of *Ash* of half an Inch square and twenty four Inches long, was broke with about an Hundred and sixty pound, and bent five Inches and a half; and the *Fir* of the same size and length, was broken with an Hundred sixty six Pound.

He also *observed*, That a piece of *Ash* of an Inch Broad, and half an Inch thick, when standing an end, was broke when it stood an end, with about an Hundred and seventy pound, and bent Nine Inches; but the *Fir* of the size and length, and in the same Position, was broken with Four hundred pound, and bent Seven Inches. Such *Observations* as these, and the Knowledge of Duplicate Proportion, is of Excellent use in designing of Engines of strength, &c. for Models of such Machines being made by a small Scale; as suppose an Inch to represent a Foot; By this, having tried the strength of the Model, the size of the *Timber* may thence be found for the great Machinament; by which means, great mischiefs may be prevented. The want of Knowledge in these Matters, hath made many a Poor Projector.

Having said something of the strength of *Timber*; our next *Observation* shall be

(41.) Of preserving *Timber*, viz. such as is wrought into Utensils, or other Necessaries for Humane Use.

It's an *Observation* worth taking notice of, the Coating of *Timber* in work, used by the *Hollanders* for the preservation of their *Gates*, *Part-Cullis's*, *Draw-Bridges*, *Sluces*, and other

Huge

Huge Beams and Contignations of *Timber* exposed to the Sun, and perpetual injuries of the Weather, by a certain mixture of *Pitch* and *Tar*; upon which, they strew small pieces of *Cockle* and other *Shells*, beaten almost to Powder, and mingled with *Sea-Sand*; which incrusts and Arms it after an incredible manner, against all these assaults, and foreign Invaders. *Evel. Silu. 94.*

Walter Burrel of *Crick-field* Esq; in the County of *Sussex*, hath Practised to burn the ends of all his Postes which he sets in the Ground, to a Coal, on the outside, whereby they continue a long time without rotting; which otherwise, would suddenly decay. *Col. Eng. Wo. 192.*

Some Coal their Ox-Yoaks in a *Lime Kiln*, after this manner, to prevent their rotting.

I find this *Observation* mentioned in an Abstract of a Letter, Written by *David Von-der-beck* a German Philosopher and Physician at *Minden*, to Dr. *Langelot*, &c. Registered in the *Philosophical Transactions*, Num. 92. p. 5185. In these words, Hence also, they slightly burn the ends of *Timber*, to be set in the Ground, that so by the fusion made by Fire, the Volatile Salts, which by accession of the moisture of the Earth, would easily be Consumed, to the Corruption of the *Timber*, may catch and fix one another.

It hath also been an *Observation* made by several, That in digging in the Earth, they have found some pieces of *Charcole*, which they conjecture might have been there above One hundred Years; and yet it seemed to be, not in the least measure inclined to Putrification, but very firm and Solid; which is an Evident Demonstration, That *Timber* being thus Calcined, will resist Putrification much longer than it can do without it.

Sir *Hugh Plat* informs us, That the *Venetians* used to burn and scorch their *Timber* in flaming Fire; continually turning it round with an *Engine*, till they have gotten upon it, a hard, black, coaly crust, and the secret carries with it great probability; for that the Wood is brought by it to such a hardness and dryness, *ut cum omnis putrefactio incipiat ab humido*, nor Earth nor Water can penetrate it: I my self (saith Esq; *Evelin*) remember to have seen *Charcoals* dug out of the Ground amongst the Ruines of Ancient Buildings, which have in all probability lain cover'd with Earth above One Thousand five Hundred Years. *Silva. 94.*

When *Timber* is used round, as when it's made use of in huge and massy *Columns*: It's an *Observation*, That such are very apt to split and cleave after they are wrought into form, (which is a great Eye sore, in fine Buildings) but if they are boared through from end to end, it is an Excellent preservative from splitting, and not unphilosophical; (I have heard *Turners* says, That make Traps to catch Moles in, that they never observed any of them to Split or Cone, as they call it, in drying or

or seasoning, after they are boarded ; tho' they generally make them of green *Timber*, for ease in working: Almost every body knows, that round Bats generally Split or Cone in at the ends especially in drying) but to cure such an accident in *Columns*, it is good to rub them over with a Wax Gloath, Painters Putty, &c. or before it be converted, the smearing the *Timber* over with *Cow-dung*, which prevents the effects of both Sun and Air upon it, if of necessity it must lye exposed: But besides the former Remedies, I find this, for the closing of the Chops and Clefts of *Green Timber*; to anoint and supply it with the Fat of *Powder'd Beef-broth*, with which it must be well soaked, the Chasm's fill'd with *Sponges* dip'd into it; this to be twice done over: Some Carpenters make use of *Grease* and *Saw-dust* mingled; but the first is so good a way (says my Author) that I have seen *Wind-shock-Timber* so exquisitely closed, as not to be discerned where the defects were: This must be used when the *Timber* is green. *Evel. Silva. 94.*

When *Timber* is Fell'd before the Sap is perfectly at rest, it is very subject to the *Worm*; but to prevent or cure this in *Timber*, I recommend the following Secret, as most approved.

Let common Yellow *Sulphur* be put into a Cucurbit Glass, upon which, pour so much of the strongest *Aqua-fortis*, as may cover it three Fingers deep; Distil this to dryness, which is done by two or three Rectifications: Let the *Sulphur* remaining in the bottom (being of a blackish or sad Red Colour) be laid on a Marble, or put into a Glass, where it will easily dissolve into *Oil*: With this, anoint what is either infected or to be preserved of *Timber*. It is a great and Excellent *Arcanum* for Tinging the *Wood*, with no unpleasant Colour, by no Art to be washed out; and such a preservative of all manner of *Woods*, nay, of many other things, as *Ropes*, *Cables*, *Fishing-nets*, *Masts of Ships*, &c. that it defends them from *Putrification*, either in waters under or above the *Earth*; in Snow, Ice, Winter or Summer, &c.

Linseed Oil, will also kill Worms in *Timber*; it was Experimented in a Wallnut-Tree Table, where it destroyed Millions of Worms immediately, and may be practised for *Tables*, *Tubs*, *Mathematical Instruments*, *Boxes*, *Bedsteads*, *Chairs*, *Rarities*, &c. *Oil of Wallnuts* will doubtless do the same, is sweeter and better Varnish; but above all, is commended, the *Oil of Cedar*, or that of *Juniper*. *Ev. Sil. 70. V. p. 6. the Num. the.*

Having laid before you some *Experiments and Observations* which have been made concerning *Felling*, *Seasoning*, *Cleaving*, *Preserving*, and of the strength of *Timber*, &c. I shall now add some of Beautifying and Adorning it; thereby, making it not only fit *Ornaments* for *Noblemens* and *Gentlemen*

mens Houses, &c. but several of which *Experiments* (viz. Varnishing especially) render it more durable and lasting.

(42.) *Observations of Staining or Dying of Wood of Various Colours.*

1. *Of Imitating Tortois-Shell.*

I have (saith Esq; Boyle) caused *Canes* to be *Stained* into the likeness almost of *Tortois-Shell*, by a mixture of *Aqua-Fortis* not too well rectified (which is unexpedient in this Work) and *Oil of Vitriol*, laid on at several times and places, upon *Canes*, held over a large *Chafing-dish* of *Coals*, that by the heat, the *Staining Liquor* may be the better sucked in by the *Canes*; which must afterwards have a *Gloss* given them, by being diligently rubbed with a little soft *Wax* and a dry *Cloth*; or else by *Varnishing*. *Boil's Usefuln. of Experiment. Phylos.*

2. *Of Staining a very Fine Yellow.*

For to perform this, a piece of *Burr* or knotty *Ash* is best, or a piece of *Maple* or *Sycamore*, or the *Sap* of *Wallnut-Tree*, or any other *Wood* that is white, curl'd, and knotty; Cleanse it well with *Prescle*, and having warmed it, with a *Brush* dip'd in *Aqua-Fortis*, wash over the *Wood*, and hold it to the *Fire* until it has done smoaking; when dry, *Prescle* it again, for the *Aqua Fortis* will make it rough: If to these, you add a *Polish*, and *Varnish* it with *Seed-lac*, and then again *Polish* it, you will find no *Outlandish Wood* surpass it; for the curl'd and knotty *Parts* admit of so much *Variety*, being in some *Places* hard, in others soft and open grained; to which, *Aqua-Fortis* gives a deeper *Colour*, than to the harder and more resisting parts. In short, you may observe, a pleasing *Variety* interwoven, beyond what one could imagine or expect. It's observed, if there be *Filings* or bits of *Metals*, as *Brass*, *Copper* and *Iron*, put into *Aqua-Fortis*; each *Metal* will produce a different *tincture*: The best *French Pistols* are stock'd generally with this sort of *Wood*, and *Stained* after this manner.

3. *Of Staining a very Fine Red.*

The whitest *Wood* takes this *Dye* best of any: Set a *Kettle* of *Water* boiling, with a handful of *Allom*, cast your *Wood* into it, permitting it to boil a little; that done, take your *Wood* out, and put into the said *Water* two handfuls of *Brasil Wood*; then return your *Wood* into the *Vessel* again, to boil for a quarter of an *Hour*, and 'tis concluded; when dry,
Prescle

Presle it, Varnish and Polish it; by which management, you will find the *Wood* covered with a Rich and Beautiful Colour.

4. Of another Red for Wood, Horn, Bones or Ivory.

Put *Mercury* into *Rain Water* for a Night, strain the clear thro' a *Cloth*, and to every Pint of *Water*, add half an Ounce of the scrapings of *Brasil Wood*; Having first boiled your *Wood* (or the like) in *Allom Water*, then boil it in this, till it is red enough to please you. *Stat. Treat. Jap.*

5. Of another Red Dye for Wood, Horns or Bones.

First, Boil them in *Allom Water*, then put them into the Tincture of *Brasil* in *Allom Water*, for two or three Weeks; or into the Tincture of *Brasil*, in *Milk*. *Sal. Poligraph.*

6. Of another Staining Red, for Wood.

Take *Fernebourg*, half a Pound, and *Rain Water*; a handful of *Quick-Lime*, two handfuls of *Ashes*; when these have been steeped half an Hour in the *Water*, and settled at the bottom, take a new *Earthen Pot*, put in the *Fernebourg*, with the *Lixivium* made of the *Quick-Lime* and *Ashes*; which, when it had been steeped half an Hour, boil it, and let it cool a little, then pour it into another new *Pot*, adding half an Ounce of *Gum-Arabeck*; take another *Pot* or *Pan*, and put in some *Rain Water*, and a piece of *Allom*, make it boil, and let your *Wood* be well soaked with this *Water*, and then let it be thoroughly dried, and then warm your *Red Colour*, and rub it on with a *Brush* as long as you think fit; and when it is thro' dry, and Polished with a *Cows* or *Dogs Tooth*, or Varnished with good *Varnish* (but it must be sized first) it will be shining, and as Red as Scarlet.

7. Of another Excellent Red Dye for Wood.

Boil *Brasil* in *Rain Water* till it be fully coloured, then strain it thro' a *Cloth*; take heed that no *Iron* touch it nor come near it; give your *Wood* one wash over with *Water* wherein *Saffron* hath been steeped, which will make it of a pale *Yellow*; and when it is dry, wash it over several times with *Brasil Water*, till you like the Colour; when it is dry,
Burnish

Burnish it with a Tooth and Varnish it, and it will be a beautiful Red inclining to an Orange Colour: If you put a Spoonful or two of *Lixivium* amongst the *Brasil*, it will make the Red the deeper; or boil it with a little *Allom*, but the *Tellowing* it, improves the Colour; and the whiter the *Wood* is, the more Beautiful will your Colour be.

8. Of another Red Dye for Wood.

Temper *Brasil* well with Oil of *Tartar*, with which, rub over the *Wood* well, and it will make it of an Excellent Red. *Lemer. Mod. Curios.*

9. Of another Red Dye for Wood.

Take *Orchanet* beaten into fine Powder, and mix it with the Oil of *Nuts*, and make it luke-warm, and rub the *Wood* well with it. *Ibid.*

10. Of another Red Dye for Wood.

Boil *Brasil* in Powder, Red-Lead a little, and *Allom* in Wine Vinegar, with this wash over your *Wood*. Out of a Joiner's M S.

11. Of a Black Dye or Stain for Wood.

Take *Log-Wood* and boil it in *Water* or *Vinegar*, and whilst it is very hot, brush or Stain over your *Wood* with it two or three times; Then take *Galls* and *Copperas* well beaten, and boil them well in *Water*, with which, Wash or Stain over your *Wood* so often, till it be Black to your mind; the oftener it is laid, the better will your Black be; if your Work be small enough, you may steep it in your Liquors instead of washing it. *Stal. Treat. Fap.*

12. Of a Cheap Black Dye for Wood, That will Endure the Weather.

Take *Galls* grossly Contus'd in a Mortar, One Pound, boil it in three Quarts of *White-Wine Venegar* till it comes to Two; with this, rub the *Wood* twice over; then take *Silk-Dyers* (Liquid) Black, a sufficient quantity, mix it at discretion with *Lamp-Black* and A. V. that it will pass a Strainer; with this, Dye over your *Wood* again; if at any time it be dirty, rub it with a
Woollen

Woollen Cloath dip'd in *Oil*, 'twill recover it and Polish it. *Evil. Silva.* This was *Experim.* by *Esq; Evelin.*

13. Of another Black Dye, for Wood, Horns, or Bones.

The best *Wood* for this purpose, is *Elder, Box, Mulberry-Tree, Pear-Tree, or Walnut-Tree*; any of which *Woods* may be made to resemble *Ebony*, by the following Receipt.

Steep the *Wood* in *Water* three or four Days, then boil it in common *Oyl*, with a little *Roman Vitriol* and *Sulphur*; where Note, the longer you boil the *Wood*, the blacker it will be; but too long, makes it brittle. *Sal. Poligraph.*

14. Of another Black Dye for Wood, which is almost *Ibidem.*

Take *Box*, or any other *Wood* which is hard and close grained, rub it with *Water* near the Fire; then take *Olive* or *Linseed-Oil*, into which, cast some *Roman Vitriol* and *Sulphur*, of each, about the quantity of a *Nut*, put all into a *Kettle*, and boil your *Box* for some time, and 'twill be like perfect *Ebony*; the more you boil it, the fairer it will be; but the more brittle. *Lemer. Curios. Mod.*

15. Of another Black Dye for Wood, which will make it resemble *Ebony*.

To Counterfeit *Ebony*, *Holly* is the best of all *Woods*, which you must put into a *Hat-makers Furnace*, where he dyes his *Hats*; when you find it by cutting, to be struck in about the thickness of a Sixpence, take it out and dry it in the shade, that it may the better drink up the Dye *Water*, then Polish it with an *Iron* to take off the foulness of the Dye; then with *Rush* and *Powder of Charcoal*, and *Sallad Oil*, as is done to *Ebony*, *Lemer. Mod. Curi.*

16. Of another Black Dye for Wood.

Put into good *Ink*, little pieces of rusty *Iron*, leaving it so some days, then rub the *Wood*, which 'twill penetrate; and Polish it with a *Tooth*, and 'twill be very Beautiful. *Ibid.*

17. *Of a Blue Stain or Dye for Wood, Horns or Bones.*

Having first Boil'd them in *Water*, then put them into the dissolution of *Indico* in *Urine*. *Sal. Poligraph.*

18. *Of another Blue Dye for Wood, which will be of a Violet Colour.*

Take four Ounces of *Brasyl*, and half a Pound of *Logwood*, boil these together in two Quarts of *Water*, adding an Ounce of common *Allom*, in this boil the *Wood*. *Lerner. Mod. Curios.*

19. *Of another Excellent Blue Dye for Wood.*

Take four Ounces of *Turnsole*, boil it an Hour in three pints of *Quick-LimeWater*, and Paint your *Wood* over with it. *Ibid.*

20. *Staining or Dying Wood, Ivory, Horn or Bones, Green.*

First, Prepare either of them in *Water* by boiling them with it; afterwards, grind of *Spanish Green*, or thick common *Verdegrease*, a reasonable quantity, with half as much *Flower of Copper*; then put them into the strongest *Vinegar*, together with the *Wood*, keeping it hot over the *Fire*, till it is green enough; if the *Wood* is too large, then wash it over scalding hot. *Stal. Treat. Jap.*

21. *Of another way to Stain or Dye Wood, Horns, or Bone, Green.*

Take *Aqua-Fortis*, and put as much filings of *Copper* into it as it will dissolve; then put the *Wood, Horns or Bones* into it for a Night. *Sal. Poligra.*

22. *Of another Green Dye for Wood, Horns or Bones.*

Let the materials be well drench'd or moistened with *Water*, wherein *Tartar*, has been dissolved; then take *Verdegrease* and temper it well with *Water*, and boil it up into a *Liquor*,
and

and then put them into, or else thoroughly wash them with the hot *Liquor* till it be sufficiently stained, and then take them whilst hot, and cast them into, or wet them well with *Allom Water* cold, and if it be not enough strained, serve it so a second time: If you would have a *Red Dye*, then, instead of *Verde-grease*, mix *Vermilion* and *Brasyl* with *Water*, as is before directed; and proceeding thus, you may, according to the mixture, make it take what Colour you please. *Arts Treasu.*

23. Of Dying or Staining Woods, of any Colour, for Inlaid or Flower'd Work, as it is done by the Cabinet-maker.

Take the moistest Horse-dung you can get, That which has been made the Night before, thro' a Sieve of Cloath squeeze out what moisture you judge sufficient for the purpose, convey it into several small Vessels fit for the design; in each of these, dissolve of *Roach Allom* and *Gum-Arabick*, the bigness of a *Nutmeg*, and with them, mix *Reds*, *Blues*, *Greens*, or what Colours best pleaseth you, suffering them to stand two or three days, yet not without often stirring them: Then take your *Woods* (of which I think *Pear-tree* is the best, if it be *Whise*) cut them as thick as half a *Crown*, which is in all reason thick enough for any *Fineer'd* or *Inlayed Work*, and of what breadth you please; making your *Liquors* or *Colours* boiling hot, put the *Wood* into it, for as long time as will sufficiently Colour them; yet some of them must be taken out sooner than the rest, by which means you will have different shades of the same Colour; for the longer they lye in, the deeper will be the Colours; and such Variety you may well imagine, contributes much to the Beauty and Neatness of the Work, and agrees with the Nature of your *Parti-colour'd Flowers*. *Stal. Treat. Jap.*

24. Of Imitating Inlaying or Marble, by Staining of Wood.

Beat the Yolk of an *Egg* in *Water* till it be thin enough to write with; take a *Pencil*, and with this *Liquor*, Vein the *Wood* according to your Fancy; when it is dry, take some *Quick-Lime* steeped in *Urine* till it be thick like *Mud*; with a *Brush* lay this on the *Wood*, when it's dry, clean it with a *Rubbing Brush*, and rub it well with a clean *Cloath*, Burnish it and Varnish it, and you will have a very fine piece of Work. *Lemer. Mod. Curios.*

25. Of another way of Staining or Imitating Marble, &c. on Wood.

Grind *White-Lead* and *Chalk* together on a *Marble*, put it into a *Por*, and Temper it again with the *Yolk* of an *Egg* beaten with *Water*; then, with a large *Pencil*, lay on this *White*, when dry, repeat it: That being dry, take a *Point* made of *Stags-Horn*, draw off the *White*, where, and in what form you will; then sprinkle *Quick Lime* mix'd with *Urine*; by this Method, the *Violet VWood* which *Dyers* use, will be Stained *Black* as *Ebony*; *Plum-Tree* and *Cherry-Tree* thus sprinkled, will be Stained *Red*; *Pear-Tree* and *Service-Tree* will be of *Reddish Colour*; *Walnut Tree* will be Stained *Black*, by mingling some *Galls Powder*, with *Quick Lime* and in *Urine*.

A *Pencil* made of *Mutton-Suit*, rub'd in those places where you would draw with *Yolks* of *Eggs*; 'twill be Excellent upon *Black Cherry-Tree* or *Plum-Tree*, or any *VWood* of a darkish Colour, *Ibid*. These ways are much used by the *French*.

26. Of Staining Wood of a Brownish Hue.

The *VWood* which we here would be understood to *Stain*, must be such as is *VWhite*; then to *Stain* it, take *Sand* and heat it in a *Brass Pan* till its very hot, then with a pair of *Pliers* put in your *white VWood* till it is stained dark enough to your mind; and thus you may do it of several degrees according to your occasion. This way is Practised by *Inlayers* and *Cabinet-makers*, to *Stain VWood* for their purpose in *Inlaying*. *Silv*.

I shall here add one way of *Staying* more, which I lately Learned, and that is,

27. Of a Yellow Staining Colour.

Take the inner *Bark* of *Plumb-Tree*, cut in pieces, put it in *Alloy VWater*, boil what you think fit in it, and it will be of a fair *Yellow*: The like may be done with *Sumach* and *Alloy VWater*.

(43.) Observations of Colouring and Beautifying Woods of Various Colours.

1. Of a Walnut-Tree-Colour.

Take the *green Peels* of *Ripe VWallnuts*, dry them in the *Sun*, boil them in *Oil of Nuts*, and rub your *VWood* with it. *Loier. Mod. Curios.*

2. Of another Walnut-Tree Colour.

Procure a good quantity of the green Husks, Shells, or Peels of Ripe *Walnuts*, and lay them up in a Heap, or more conveniently in some *Earthen Vessel* till they be Rotten and Black; then take them and Press out the Juice; with this, you may colour the *Wood* of a *Walnut-Tree* Colour, and Vein it also, with a *Brush* or some *Woollen Rags* bound up together. A Joiners M S.

3. Of another Walnut-Tree Colour for Wood; which also, may be made to nearly resemble Olive.

First let the *Wood* be well Plained and cleansed smooth; and you are to observe the whitest *Wood*, and such as the Grain is least visible in, is fittest for this purpose; as *Aspen*, *Abel*, *Sycamore*, *Maple* or good white *Beech*, &c. You must first Colour it over with *Turmeric* boiled in common *Water*, with a little *Gum*, *Glew* or *Size* in it, to bind it. When you have made it of a good *Yellow*, then rub it smooth with a good stiff *Brush* and then you shall give it a second Colour, which must be thus made. Take some *Lap. Fuligo* in Powder, to which, add some *Spanish Brown*, in Powder also, and a little *Gum-Arabick* or *Common*, the first is best; put all these into common cold water, and let it stand a Week or Fortnight, often stirring it with a Stick; or you may for dispatch sake, boil it, and then you may put some *Glew* instead of *Gum* (which is better if you intend to *Varnish* it) this Colour, which way ever prepared, must be laid on cold, which you may Vein as you please with a *Brush* or *Rags* bound up upon a Stick: You may also imitate the stringing of Work, if you have a piece of hard lignous Body put upon the points of a pair of *Compasses*, and a *Gage* of the same for strait Lines: You must be sure to be very expeditious in this Work, or else it will be too dry for your purpose; when it is dry, rub it well with a short, stiff rubbing *Brush*, till it's smooth and free from any asperities caus'd by the Colour: Then take some *Yellowish Wax*, and rub it well with it, and having a hot smoothing *Iron* ready, run him to and fro over it, till you have well dispersed it; and then rub it with some lignous Body to take off as much of it again as you can; after that, with a stiff *Brush*, and also with a piece of *Horse-Hair*, or a *Brush* made of such such *Rushes* as your *Hand-Baskets* are made; and lastly, with a Clout: After this, you may *Varnish* two or three times with warm shining *Varnish*. Ibid.

4. *Of making the Grain of Walnut-Tree upon White Wood.*

You must spread upon the *Wood* Seven or Eight lays of strong *Glew*, till it become shining, and then quickly give a good many Blows with a wooden *Brush*, well wet in common *Water*. *Lemer. Mod. Curios.*

5. *Of a good Brown for White Wood.*

Take some *Quick Lime* which let be well soaked in *Urine*, and lay it on the *Wood* pretty thick, when it's dry, rub it off with a stiff *Brush*, and then take some *Linseed-Oil* and do it over, or else *Size* it over and *Varnish* it : This did most properly belong to the *Staining Part*, but it was forgot ; for this is a *Stained Brown*. *Join. MS.*

6. *Of Colouring Wood with Black Varnishing or Japan.*

This Colouring is done in imitation of *Japan Work* ; which work, is not only an Ornament, but also a preservative to the *Wood*, against the *Vorm*, damp, and corroding time : The *Wood* which you would *Japan*, must be close grained and well wrought off, and perfected smooth, and kept warm by a *Fire*, but not too hot to blister it. But to proceed to laying on of the Colour ; Put some of the thickest *Seed-Lack-Varnish* into a *Gallipot*, adding to it, as much *Lamp-black*, as will, at the first, Wash, Blacken, and discolour the *Wood* with this Colour over your *Wood* three times, permitting it to dry thoroughly between every turn. After this, take more of the *Lack-Varnish* and mix it with *Lampblack*, to the same degree of thickness with the former ; with this black Composition, wash it over again three times ; between each of them Prescle it smooth, and let it be perfectly dry : Then, with a quarter of a Pint of *Seed Lack*, the thickest it must be, mix of *Venice Turpentine* the quantity of a *VValnut*, and shake them together till it is dissolved ; then put in *Lampblack*, enough to Colour it, and no more ; with this, wash it six times, letting it stand Twelve Hours betwixt the three first and the three last washings ; cover this over with the top and finest of the *Seed-Lack-Varnish* ; it must also be just tinged with *Lampblack* ; it must be *Varnished* twelve times with this, standing as many hours between the six first and six last washings ; with this Caution, that it be dry betwixt every distinct washing : After this, let it rest five or six days, and then Polish it with

Water and *Tripolee*, according to the Directions for *Olive*, Numb. 46. and Numb. 48. But however, take along with you this Remark, That you allow three times distinct for Polishing for the first Labour at it, till it is almost smooth, and let it stand still two days; the next time Polish it till its near enough, and then lay it by for Five or Six days; after which, Polish it off and clear it up, as directed in *Sett*, 46. Numb. 47. I will assure you, I have, by this means, made as good, as glossy a *Black*, as was ever wrought by an *English* Hand; and to all Appearance was no way inferiour to the *Indian*. *Stal. Treat. Jap.*

7. Of another Japan Black.

Lay your *Black* as before, and take of the best *Seed-Lack-Varnish*, and the first *white Varnish*, ana alike, and give to it a Tincture only of *Lamp* or *Ivory Black*; wash your work with it Six or Eight times, let it stand the space of a Day or two, and dry between every turn; then repeat it Four or Five times more, keeping it just tepid; and having rested a day or so, anoint it as often with fine *Seed-Lack-Varnish* only; in a weeks time after, it will be Arid enough to be made Polite, and not before. *Ibid.*

8. Of Colouring Wood with a White Japan.

This is a Piece of very nice and curious Work, nothing must be used that will either soil or Pollute it. You must take some *Ischiocola Size*, and scrape into it as much Whiting as will make it of a reasonable Crassitude and Consistence, till with a *Pencil* di'd into it, it will whiten the Body; let it not be too thick nor too thin, but with your Brush made of the softest Hog-bristles, mix and incorporate very well the Whiting with your *Size*: This being done, whiten your Work once over, and when it's thro' dry, do it over again, and when it's dry, repeat it a third time: After which, let it stand Twelve Hours, but be sure to cover it, and defend it from Dust; before 'tis Varnish'd, Presle it smooth, and as close to the *Wood* as you can conveniently: Then mix *white Elake* with your *Size* only, that it may lye with a full fair Body on your Piece. With this, three several times whiten your Work, giving it sufficient time to dry between each of them; then Presle it Extraordinary smooth, but come not too near the wood but by all means keep your distance: Then take some white *Starch* boil'd in fair *Water* until it become to be somewhat thick, and with it almost Blood warm wash over the whole twice, but let it be dry betwixt each washing. After Twenty Four Hours rest, take the finest of your *white Varnish*

Varnish, and with a *Pencil* (first dip'd in Spirits, or washed therein to free it from Dust) *Varnish* over your Work Six or Seven times. and after a day or two do it over again. These two fits of *Varnishing* if done with a fine careful Hand, will give it a better gloss than if it were *Polish'd*, if not, it will then be requisite to *Polish* it; and in order thereunto, you must give it Five or Six washes of *Varnish* more, so that if it is done so well that it stands not in need of a *Polish*, two turns of *Varnishing* will suffice, but if it must be *Polish'd*, three are absolutely necessary: besides, a weeks rest before you begin to *Polish*. You must take care, That your *Linnen* and *Tripoly* be very fine, and your Hand light and gentle; your *Cloth* neither too wet nor too dry; and when you clear it up, give it the finishing stroak with your *Flower* and *Oil*. *Ibid*.

6. Of Colouring Wood with a Red Japan.

This Beautiful Colour we shall here give directions to make according to three several *Observations*: As first, The common usual *Red*; second, the deep dark *Red*; and lastly, the Light Pale *Red*.

To Experiment the first, Take *Vermilion*, mix it with common *Size*, or the thickest *Seed-Lack*; the last I judge to be best, because it will not peel off in *Polishing*, as that mix'd with *Size* will frequently do: neither is it more chargeable, seeing it helps better to bear the body of the *Varnish*: Your mixture must be neither too thick nor too thin: Your Work being ready and warm, produce your *Vermilion* well mix'd with the *Varnish*, wash it four times with it, then allow it time to dry; and if your *Red* be full and with a good Body to your liking, Prescle it very smooth; when you have so done, wash it Eight times with your ordinary *Seed-Lack-Varnish*, and grant it repose for Twelve Hours, then Prescle it again, tho' slightly, to make it *Polite*. And lastly, bestow Eight or Ten Washes of your best *Seed-Lack-Varnish*, and having laid it by for five or six days, *Polish* it, and clear it up with *Oil* and *Lampblack*.

Secondly, The dark or deep *Red* is thus made. When you have laid on your former *Red*, take *Dragons Blood* and pulverize it, and as you see occasion, mix a little at a time with your *Varnish*, you will find, That a small Portion will extremely heighten your Colour; as also, That every Wash will render it deeper; but when you find it has acquired a Colour a'most as deep as you design, forbear; for you must remember, you have more *Varnish* of *Seed-Lack* to lay on, which will supply what is wanting. Consider therefore, how many Washes are still to be laid, and according to that, use your *Sanguis Draconis*. Then as for the *Burnishing* of it, do as the first *Red* was done.

As for the Third *Red*, Take *white Lead* finely Pulverized with your *Muller* and *Marble-Stone*, you must do it dry; mix with it *Vermilion*, till it becomes paler than you would have it, for the *Varnish* will heighten it: Stir therefore, *Vermilion*, *white Lead*, and *Varnish* together, very briskly; which done, give your Work Four Washes, and then follow the Prescriptions for the first *Red*.

You must, as in the foregoing mixture, consult, how many times you have to *Varnish* after the Colour is laid; for if many, consider how they will encrease and heighten the Colour, which for that reason must be paler, and have a more large Portion of *white Lead*. Ibid.

10. Of Colouring Wood of a Chestnut Colour, Japan.

This Colour hath been much in use and esteem for *Coaches*; and also for *Tables*, *Stands*, and *Looking-Glass-Frames*; It sets off *Gold* well; and also other *Metals*.

The things which are necessary to Compose this Colour, are *Indian Red*, or else *Brown Red Oker*, which will serve as well; take of either, what quantity you imagin will serve your turn, and grind it on a *Marble* with a *Muller*, and mix it with ordinary *Size*, as fine as *Butter*; from thence, transfer it to a *Porringer*; then take a little *white Lead*, and grind it very fine with the same *Size*. In the Third place, have *Lampblack* ready by you, mix this and the *white* with the *Indian Red* and *Oker* in the *Porringer*, stirring and incorporating them together: If the Colour produced by these three, be too bright, darken it with *Lampblack*; if too dark and sad, assist it with *white Lead*; this do, till you have master'd the Colour you wish for. You must here observe, That the same Colour exactly which you make when it is mix'd and wet, will also arise when it is dryed and *Varnished*, altho' when it is laid and dry, 'twill look otherwise. Now when the Colours are thus managed in the *Porringer*, set it over a gentle *Fire*; put to it so much common *Size* as will give it a fit Temper to work (neither too thick nor too thin) being thus qualified; with a Hogs hair Brush, wash over smoothly your Piece; let it dry, and repeat it until your Colour lie full and fair: Again, give it a drying time, and Prescle it smooth, but not too near the *Wood*. After Eight days rest, give it three or four Washes with the finest of your *Seed-Lack-Varnish*; when that is dried on, *Varnish* it up to a Body fit to receive a *Burnish* with your *White Varnish*; when it is thoroughly dry, clear it up with *Lampblack* and *Oil*.

11. Of Colouring or Japaning Wood of an Olive Colour.

This Performance is every way answerable to the former, only instead of those, put *English Pink*, grind it with common *Size*; and when you have brought it to the Consistence of *Butter*, convey it to a *Porringer*; and there, *Lampblack* and *WhiteLead* mix'd with it, produce an *Olive Colour*; if too light, *Lampblack* will prevent it; if too dark, the other: But farther, if it looks too *Green*, take raw *Umber*, grind it very fine with *Size*; add of that, enough to take away the *Greenness*; and then, nothing remains, but a due heed and Observance of the foregoing Rules for *Chestnut*.

But before you leave this *Section*, we must tell you, That it is an *Observation*, That all Colours laid in *Size*, will not Endure so Violent a *Polish* as those in *Varnish*, but are more subject to be rubbed off. *Ibid*.

12. Of Imitating Tortise-Shell upon Wood.

Before *Japan* was made in *England*, the Imitation of *Tortoise-Shell* was much in Vogue for *Cabinets*, *Boxes*, *Tables* and *Glass-Frames*. To Counterfeit this well, your *Wood* ought to be close Grain'd, Polite and cleanly wrought off; as *Pear-Tree*; but if it be coarse grained *Wood*, as *Deal*, *Oak*, or the like, you must Prime it with *Whiting*: When either of these are Prescl'd Sleek, as it is necessary; take a fit *Varnish* Tool dip'd in the thickest of your *Seed-Lack-Varnish*, and wet with this *Varnish* the breadth of one Foil of *Silver*, which you must take up with *Cotton*, and clap it on whilst it is moist, dabbing it down close to the Work: This done, wash again, and lay another Foil of *Silver*, ordering it as before; and so continue till the whole is so over-spread with *Silver*: Next grind *Collins-Earth*, very fine, mixed either with common *Size* or *Gum-water*, being finely ground: With this, spot the darkest of your *Shell*, striving to imitate it as near as you can; and in order hereto, you must procure a Piece or more of the true *Shell*, that hath much Variety in it. You may observe, That when this is done, That several *Reds* lighter and darker, offer themselves to view, on the edge of the *Black*; and sometimes lie in streaks on the Transparent part of the *Shell*: To imitate this, you must grind some *Sanguis Draconis* very fine, with *Gum-water*; and with a small *Pencil*, draw those warm *Reds*, flushing it in and about the dark places more thick; but fainter, thinner, and with lesser Colour towards the lighter parts of the *Shells*; sweetening it so, That by degrees, it may lose its strength of *Red*, being inter-

mixt with, and quite lost in the *Silver*, or more *Transparent* part. 'Tis worthy your *Observation*, That those who are expert and ready at Spotting or Working this imitation, do usually grind the formentioned Colours dry and very fine, and mix them with fine *Lac-Varnish* as they work them; which is most agreeable and proper, being not so apt to be *Burnish'd* off, as *Size* or *Gum-Water*: When this is done and dry, give it Six Washes of your *Seed-Lack-Varnish*; after which, let it rest one day, and then *Prescle* it gently till it is *Polite* and fit for a second Operation: In order to which, grind *Dragons Blood* and *Gambogium*, and; but a small quantity, and very fine; put them into as much *Seed-Lack-Varnish* as will wash them Six times more; let it stand Twelve Hours, and then allow it a third *Varnishing*; and with the last mixture, wash so often till the *Silver* be changed of a *Go'd* Colour. *Observe*, That your first washings may be with the *Course*, the two last, with the fine and clearest of your *Seed-Lack-Varnish*: You must *observe*, not to make your *Varnish* too thick and high Coloured with *Gambogium* and *Sanguis Draconis*, but heighten it by degrees; otherwise, your *Silver* will be too high Colour'd before you have given it a sufficient Body of *Varnish*: When it hath stood two days, *Polish* it, and clear it up, as you was instructed in the *Black Japan*. *Ibid.*

13. Of another way of Counterfeiting Tortoise-Shell upon Wood.

First, *Prime*, *Lacker*, and *Size* your Work in *Oil* very thin, as is taught in the Art of *Gilding*; and when your *Silver* is laid on and dried, let these Colours be ground fine and thick with drying *Oil*, place them on your *Pallet*; they are, burnt *Umber*, *Collins Earth*, *brown Pink* and *Lack*. Do over your work with *Turpentine Varnish*; and whilst it is wet, mix *brown Pink* and *Lack* thin with *Varnish*; and lay all your faintest Colours or Spots, which you may soften very sweetly, seeing your *Varnish* is moist. After three Hours standing, or longer, if the Colours are dry, with a large soft *Tool*, pass it lightly over; and again wetting it, lay in your *Clouds* more warm and dark with *Collins Earth*, before 'tis dry; always *observing* the *Life*, and sweetening your Work; which is, blending and mixing two Colours after they are laid; so that you cannot perceive, where either of them begin or end, but insensibly join with each other: If the *Clouds* are not dark enough, repeat the *Clouds* and *Varnishing* once more where it is required: When it is well dried, Glaze it two or three times with *brown Pink*; yet a little *Tincture of Verdigrise* will not be amiss; if you had rather, you may *Varnish* it with *Lack-Varnish*, and finish it as you did the former. *Ibid.*

14. Of another way of Counterfeiting Tortoise-Shell upon Wood.

First, lay a *White Ground*, then with convenient Colours (as *Vermilion* with *Auripigment*) duly mix'd with common *Varnish*, strike and shadow the *white* ground with a wild fancy (as neatly imitating *Tortoise-Shell* as you can) which being dry, strike it here and there with *Red-Varnish* (mixed with a little *Cinnabar* or *Indian Lake*;) then up and down the Work as nature requires; touch it with *Varnish* mixed with any good *Black*; then stroake it over with *Universal Varnish* Four or Five times, letting it dry every time; lastly, let it dry a Week, and with *Pumice-Stone* (well pulveriz'd) and a wet Cloth, *Polish* it; then go over it three or four times more with *Universal Varnish*; and if need require, *Polish* it again with *Calcined Tin* as before; after which, you may strike it over again with the same *Varnish* once, and it will be done. *Sal. Poligra.*

15. Of Counterfeiting Tortoise-Shell another way upon Wood.

A *White Ground* being laid, and lineared over with *Vermilion* or the like; lay over the same, some *Gold* or *Silver Foil*, either with *Gum-Ammoniacum*, *Lake*, common *Varnish* or *Glair*; this done and being dried, shadow it according to reason, striking it over here and there with *Yellow Varnish*; and with the *Yellow Varnish* mixed with a little *Red Varnish* (all things being done in imitation of the *Shell*) strike it several times with the *Universal Varnish*, and *Burnish* it (in all respects) as before. *Ibid.*

16. Of Imitating Marble upon Wood.

Take *Universal Varnish*, with which, mingle *Lampblack* (or other *Black*) and *White-Lead* finely beaten; and with a *Brush-Pencil*, Marble the thing you would *Varnish*, according to your Fancy; again, being dry, strike it again two or three times over with clear *Varnish* alone, and it will be perfect. *Ibid.*

17. Of Imitating Marble another way upon Wood.

Whiten and prepare your *Wood* in all respects as you do for *white Japan*; and after you have done it over with *Elake-white* or *White Lead*, if you design a *White*, with some *Veins*,

Veins, use some *Vine Black* (which is made of cutting of *Vines* Calcined and Ground) mix two or three degrees of it with *white Lead* and a very weak *Size* being warmed, until you have produced the intended *Clouds* and *Veins* of the *Marble*. Next, with a clean *Brush*, wet your Piece over with *Water*, and before it is dry, with a *Camels-Hair-Pencil* dip'd in the palest thin mixture, flush or lay the faintest large *Clouds* and *Veins* of your *Marble*; which being laid on whilst the work is wet, will lie so soft and sweet, that the Original will not exceed it: Then if your Work be not too dry, take a smaller *Pencil*, and with a Colour one degree darker than the first, touch all the lesser *Veins* and Variety of the *Marble*: If your Work dry too fast, wet it again with the *Brush* and *Water*, and lay not on your Colours when the *Water* is running off, lest they bear it Company. Lastly, take a small pointed *Feather*, and with your deepest Colour touch and break all your sudden or smaller *Veins*, irregular, wild, and Confused, as you have them in the Natural *Marble*. After a days drying, Cold-clear it; i. e. do it over with *Ichthiocola*, or *Parchment Size*; then *Varnish*, *Polish*, and clear it up, according to the Directions, in *White Japan*.

By mixing Colours this way, you may imitate any sort of *Marble*; and if neatly done, well *Polish'd* and *Varnish'd*, it will not only exceed any *Marbling* in Oil, but will in Beauty and Gloss equal the real *Stone*. Ibid.

18. Of Imitating Lapis Lazuli upon Wood.

Upon the Ground of *white Lead*, *Spodium*, or the like, in common *Varnish* (being first dry) lay *Ultramarine*, or some other pure *Blue* well mixed with the *Universal Varnish*, so as that the Ground may not appear; then, with wild irregular streaks (in resemblance of Nature) with *Liquor* or *Shell-Gold* run stragling all over the *Blue*, adding very small specks upon the *Blue* part of such various Colours as are usually seen upon the *Stone*. *Salm. Poligr.*

19. Of Colouring a good Red upon Wood, which will represent Speckle Wood.

Boil *Brazil Pulverized* in *Wine Vinegar*; add to it a little *Allom* and *Red Lead*, being well boiled, wash over your *Wood* with it; and then to speckle it, take some *Quick Lime* and *Urine*, and a little *Allom*, and let them be well incorporated; and with this Composition, you may speckle it according to your Fancy. *Foin. M. S.*

20. Of another Red for Wood.

Take *Vermilion* and grind it very fine with *Size*, made of *Glovers-Shreds*, or of the cuttings of *Parchment*; or which is yet better, with those of *Vermilion*; this being evenly laid on your *Wood* when dry, and laid over with common *Varnish*, which preserves it from wet, and gives it a gloss: But if you would have it look very well, then give it several washes with good *Seed-Lack-Varnish*, and *Burnish* it according to our former Directions for some other Colours: I have seen *Stands* and *Hanging-Shelves* made of a very fine *Red*, thus. *Eff. of the use of Nat. Philos.*

21. Of Colouring Wood with another fine Speckled Red.

Grind *Vermilion* with *Water*, then *Size* it, and grind it with a drop or two of *Yolk of Egg*, with this Colour speckle your *Wood* with a *Pencil*, and your work being dry, take *Lake* with *Water* and a little *Size*, two drops of *Yolk of Egg*, wherewith you shall spot with the end of the *Brush*; and let there remain as much *White* as you shall lay on *Red*; then *Burnish* it, (or *Varnish* it) with a *Tooth*, and if you have any Mouldings about your Work, you may *Gild* them and *Burnish* it, and it will look very fine. *Lemer. Mod. Curios.*

22. Of Colouring Wood after the manner of Marble.

Lay Seven or Eight Layers of *White*, as it were to *Gild* with *Burnish'd Gold*; then grind *Black* which is not much over *Sized*; adding thereto a little *yitel* of an *Egg* and a little *Saffron*; having laid it on, let it dry, and then *Burnish* it exactly: By this means, you may Counterfeit to the Life, all sorts of *Marble*, having a little Experience in Colours; and make also all sort of Work; as *Frettized Work*, *Flat-Work*, *Ovals*, &c. Let there be in the Colours a little *yitel* of *Egg* and *Saffron*, i. e. in such as can bear it, Colouring the *Marble* with diverse Colours; the Colours must be laid on clear, like *Threads*: You may also on a Ground whited, as I have said, pour out a *Shell* full of Colour in one place; then turning it shelving on one side, cause the Colours to run, which will make *Veins*; then take another *Shell* full of another Colour, and do the like, so continuing with all your Colours; or else with a gross *Brush*, lay all your Colours very clear near one another. This depends on him that works it. After your Colours are dry, you may make use of the *Pencil* to repair the

the defects; then *Burnish* your work (or *Varnish* it) and it will not be subject to *Dust*. *Leme. Mod. Curios.*

23. Of Beautifying Wood with a Yellow Colour.

Having laid your *Wood* over with *white*, as you have been already told; take *Yellow-Oker* of *Berry*, or smooth *English Oker*, which you shall grind very fine with *Water*, putting thereto a little *vitel* of an *Egg*; then put *Size* to your Colour and having mixed it well upon a *Marble*, you shall therewith Paint your *Wood*; which being dry, you shall draw a shadow, with a little *Black Hematite* (wherewith *Cutlers Sanguine* their *Hilts*) ground with *Water*, and a drop or two of *Vitel* of *Egg*: then mix *Size* to make the Colour wherewith you are to shadow *Stick*; and for the shadow, observe to take *Umber* or *Moss*, or else *Lampblack* *Water*, then heighten it with *Oker* and *Chalk* mixed together with a little *vitel* of *Egg*, whereof you shall make tryal before your Colours; then *Burnish* it with a *Canine Tooth*. If you design to *Varnish* it, you must give it a *Layer* of *Size* before you lay on your *Varnish*: And if you will, you may Paint your *Figures* and *Leaves* in *Oil*, *Varnishing* the *Figures* without *Varnishing* the *Ground*. *Ibid.*

24. Of Beautifying Wood with Black; Discovering the White Ground thro' it.

Having well Coloured your Work with *White*, well *Polished* and *Preserv'd* it; take *Lampblack*, and having ground it with the *Vitel* of *Egg*, make tryal of some of it, to see whether the *Black* when fix'd, will *Burnish* bright; you must *Size* your *Black* as much as is necessary to make it stick. With this *Black* you must Colour your Work, whether *Picture*, *Frame*, or the like; and being well laid on, and dry, you shall *Burnish* it with your *Tooth*. Then take an *Awl* or *Bodkin* of *Iron* sharpened and flatned at the end like a *Chisel*, of such a breadth as you desire your *Fillet* to be; you may with your *Ruler* and this *Iron* thus sharpned, draw *Fillets*; scrape off the *Black* till you come to the *White*; you may also if you will, with a *Bodkin*, make *Moresk* Works, which you may hatch into every *Leaf*; as also other branched Works; the *Imbossment* whereof, you may hatch by scraping off with your *Iron* or *Bodkin*, the *Black*, till such time as the *White* be seen, still keeping your *Iron* sharp and smooth: Hereby your Work will be of a fine *Black*, and if well *Burnish'd*, or *Varnish'd* and *Polish'd*, like *Marble*; wherein you will have branched Works, which will seem like *Ivory* or *Harts-horn* inlaid in the *Wood*.

If your *Figures* appear too much shadowed after you have drawn out all your Work with a *Bodkin*, take one or more *Irons* like a Folding-Stick, or yet blunter, as you shall see convenient; with which *Iron*, well smoothed and hardened, you shall as evenly as you can, rub your *Figures* till there appears no more *Black*, nor letting your *Iron* enter any farther than the Superficies of the *White*, i. e. When the *Black* shall be rubb'd off, and the *Figure* shall appear very *White* and smooth; then shall you *Burnish* with your *Tooth* the *White* which you have discovered; afterwards with a little *Pencil* you shall draw the *Lines*, and hatch the shade, as if it were *Horn* Engraven or Carved. *Ibid.*

25. Of Beautifying Wood, by making upon an open White Ground, Fillets, Branched Works, or Figures with Black.

You must first lay your *Wood* over with boiling *Size*, according to the method of lying upon *White Gilding* with *Burnish'd Gold*: Having *Sized* it, take *Lampblack* well ground with *Water*, then *Size* it as the *White* and go over your Work Five or Six times; then *Prescle* it; then take of the same *White*; amongst which, you shall Grind as much *Vitel* of *Egg* as will make the *White Polish*; and with this *White*, go once or twice over your Work; when it is dry, *Burnish* your *White* with a *Dent*; then with your *Iron*, draw upon your *White* Fillets, Branched Works, or Portraits, according to your Fancy, till the *Black* appears: Thus some of your Work will seem to be *Ivory*, and your *Black* will seem to have been Engraved, or like pieces of *Ebony* inlaid upon *Ivory*; you should have by you little pieces of *Polish'd Ivory*, the better to represent its Colour, which is not so white as *Chalk*, but a little inclining to *Yellow*; and this you may imitate, by grinding with your *Chalk* a little *Yellow-Oker*, or a little *Pale Masticot*, or the *Bones of Sheeps Trotters* burnt and ground to *Powder*. *Ibid.*

26. Of Beautifying Wood, by representing Enamel upon it.

Having gone over your Work Seven or Eight times with *White*, and *Polish'd* it with *Prescle*; you shall go over it with *Lampblack* mix'd with *Vitel* of *Egg* (once or twice) you may put in it some *Saffron* also; let all be well ground with *Water*, putting thereto as much *Size* as is necessary to make it stick; but have a care of putting too much, and make a Trial, to see whether the *Black*, when *Burnish'd*, Shines like

like unto *Polish'd Marble*, from which this *Black* doth no way differ, provided the *vitte* of *Egg* be put exactly in such quantity as is fit; because, if there be too much, it will not *Polish* bright, and will in time lose its *Polishing*. Your work being thus well laid and *Polished* with a *Dent* longways and overthwart, draw such *Figures* as you please; this done, take off your *Black* mix'd with a little *White* to render it somewhat *Grey*, and with your *Pencil* draw out the Proportion or Lines of your Work, which must be done to hinder your *Oil* from separating upon your *Black* Ground; then draw with *white Lead* in *Oil*, such *Figures* as you please, which shadow according to Art, with *White* and *Black*, putting some *Azure*, to the end your shadowing may bear a little upon the *Blue*. Let your *White* and *Black* be ground with drying fat *Oil*, that it may not sink into the Work, but may Shine as if it were *Varnish'd*: But if your *White* and *Black* shine not enough, you may *Varnish* them with drying *Varnish*, which you shall lay only upon the *Figures* with the point of a *Pencil*, if you will here, and there lay on some *Shell Gold*; you may do it with a *Pencil*, but Gum your *Gold* very little, that you may *Burnish* it afterwards, if you will; because the *Gold* in this sort of Work is laid on only in little Lines, on the ground of small branched Works; and take heed, That on the *Figures* made of *White* and *Black*, there be no *Gold* laid, till the *White* and *Black* begin to dry, after the manner of *Gold* Colour, and it will easily take and hold, if you lay it on at such a time as the *White* is neither too wet nor too dry; you shall do the like upon the *Varnish*, if it be necessary, and your Work will not differ from the *Enamels* of *Limoges*; in the Ground whereof, you may see your self, as in *Polish'd Marbles*, which is often used to Adorn *Closets* with. *Leme. Mod. Curios.*

27. Of Beautifying Wood, by discovering Gold under a Black Colour; a great Secret, and much used in France; it makes things very Beautiful, and almost as fine as things which are Gild in China.

Having well *Burnish'd* your *Gold*, grind *Lampblack* with *Linseed-Oil*, or *Oil* of *Nuts*, adding as much *Umber* as *Black*, to make it dry; then as much *Spike-Oil* as *Linseed-Oil*; make trial with one Leaf of *Gold* *Burnish'd*, lay the *Black* upon the *Gold* very smooth and even; then let it dry about a Day, more or less, according to the Season; when it's dry enough, 'twill not stick to your Fingers; then take a point of *Ivory* or *Stags-Horn* well sharpened, rub it on a piece of *Glass* to take off the roughness, that it scratch not the *Gold* or the *White*; then draw

draw what you please with the point, discovering the *Gold*, if it appear bright and shining, and that the *Black* be not uneven and slovenly about the Edges of the stroaks you have made, then is your *Black* in good Temper; but if in discovering the *Gold* it seem *Tarnish'd*, your *Black* is not dry enough; if the *Black* be troublesome to get off, and cannot be easily done with an unsplit *Pen*; Then mix *Spike-Oil*, till it comes to work easily, clean and bright; then may you easily draw the finest *Hair Stroaks*. Your *Black* thus made, cover your *Burnish'd Gold* all over with a soft *Pencil*; then with a *Feather* of a *Turkey-Cock's Tail*, Paste over the *Black* as smooth and even as you can, free from all manner of Dust or Filth; being dry, and having made your Draught or Figure as large as the Work, follow the Tract of the Draught, with the Point, and discover or lay open the *Gold*.

If you would have the Figures of little Beasts or Birds, or what ever else you fancy, observe the strongest Lights of them, and discover them by hatching with a *Pen*, or the point of a *Pen*, if not too sharp; but if by the stroaks approaching too near one another, you make a Fault, you may mend it by laying on a little *Black*, letting it dry; if the way of making great Lights be not convenient, or the Shadows are more easy and pleasing to you, discover the *Gold* with a Point of soft *Wood*, that it may not scratch the *Gold*, which you must discover or lay open the whole bigness of your Figure, shadowing the proper Places, as the *Nose*, *Eyes*, *Hair*, &c. leaving it to dry; then hatch it according to the Judgment of him that draws it: To know when it is dry enough to hatch; always, at the same time you cover your Work, cover a little waste piece for trials, to prevent the spoiling of your Work; being Finished, leave it three or four Days to dry, and *Varnish* it with drying *Varnish* twice, if you see cause; when you lay on the *Black*, do but one piece at a time, because some by being too dry, will be troublesome to discover the *Gold*: Take care also, That in first laying on of the *Varnish*, that you spread it gently, for fear of defacing your Draughts. *Ibid.*

28. Of the same Way of Beautifying of Wood, by a more easy Method.

Your Work being cover'd with *Burnish'd Gold* or *Silver* (it matters not which) mix and grind *Lampblack* and *Umber* together very well with *Water*, taking care that you put not so much *Umber* as to destroy the *Black*; then add some *Vitel* of *Egg*, which grind with it, and lay it on your Work with a soft *Pencil* or *Brush* very smooth, when dry (if you find cause) give it a second laying of the same *Black*, and with an *Iron* Point very smooth, discover your Work; if the

the *Black* come not easily off, then there was too little of the *Vitel*; if the strokes be too broad and ragged, then there was too much of the *Vitel*; this way of discovering the *Gold* is more shining than the other; but be sure to be careful, that in *Varnishing*, you pull not off the *Black*, nor cause it to sully, to that end, be sure to work with a soft *Pencil* and smooth stroke; you need not fear much the laying on of the *Varnish* the second time, provided it be not too thick, and that it be *Oil of Spike Varnish*.

29. *Of Beautifying Wood after the same manner, but by a something different Method.*

Having laid your *Black* on the *Burnish'd Gold*, as before; mix ana parts of *Linseed* and *Spike Oil*, which lay lightly on with a large *Pencil*; let it dry Four or Five Days, more or less, according as you find the *Gold* more or less easy to appear bright and shining; by this way you may allow almost what time you will, always remembring to make a trial before you fall to Work; for *Blue*, take *Azure*; for *Red*, take fine *Lake*; for *Green* *Verdegreafe*; and so of all other Colours, being mix'd and ground with the *Vitel* of *Eggs*, as is before directed. *Ibid.*

30. *Of an Exquisite Way of Enriching and Beautifying all sorts of Wooden Work.*

Cover your Work with hot *Gluten*; then with the foresaid *Gluten* and *Whiting*; upon this, lay the *Size* for *Burnish'd Gold*, and lay on the *Gold* or *Silver*, and *Burnish* it; then take right *Indigo*, grind it with *Water* and the *Vitel* of *Eggs* being very thin and clear; lay it on the *Gold* or *Silver*, so as it may appear thro' it; being dry, Pounce your Pattern of *Paper*, being whitened with *Chalk*, then with the same *Indigo*, draw over the Pounced Strokes of your Figures as neatly as you can, so as if you was to draw a Figure with a *Pen* upon a piece of *Paper*; then with the same *Indigo* made thinner, make the necessary Shades; after that, with *Umber*, then heighten with an wooden Point, by hatching the Lights; then *Varnish* the Work, which will seem *Enamell'd*. *Ibid.*

31. *Of Performing the last Experiment another Way, but with a more Glorious Colour.*

Instead of *Indigo*, steep *Dutch Turnsole*, a Day or two in *Water*, strain it thro' a Cloth from *Dregs*; grind and mix this *Water* with some *Vitel* of *Eggs*; lay this on your *Silver*, then with
Turn-

Turnsole ground with *Turnsole Water*, draw with a *Pencil* what Lines or Figures you please, which you may shadow and hatch in their proper Places, which heighten in discovering the *Silver*, as is before directed; then *Varnish* it. To make a *Purple Ground*, Boil *Brazil* in *Allom Water*, and mix it with *Turnsole Water*.

This will not last so well as that done with *Indigo*, because the *Turnsole* in time is apt to turn *Red*, and will stain the *Silver*; therefore, before you *Varnish*, lay upon it *Glair*, which will make it much more durable, and very beautiful. *Ibid.*

32. Of Beautifying Wooden Work (as Picture-Frames, &c.) with a Black Ground fill'd with Flowers; either in Water or Oil Colour.

Having your Frame or other Work prepared with *White*, blackned and burnished, (you may, if you please, Gild with Burnished Gold, or Gold in Oil, the Mouldings) then Paint upon your Freeze Flowers in *Water Colours*, after the manner of Limning: Having drawn the design upon the Freeze or Frame of a Picture (either by pouncing or otherwise) with *Black Lead*, you must lay on *White* mixed with *Size*, wherewith you shall draw the Platform of your Figures, Flowers or Branches, which you design to Paint in Colours: But if you will Paint your design in *Oil*, you shall first lay it with *White Lead* in *Oil*; then being dry, lay your Colours in *Oil* thereon. You may Paint Flowers upon a *White* Ground, the *White* being made Polite with *Prescle*, lay on your *Water Colours* after the manner of Limning. *Ibid.*

33. Of Beautifying Wooden Work, as Picture-Frames, or the like.

Having your Work cover'd with *Burnish'd Silver*, take *Gluten Vellum*, or *Parchment* boild to a thick Jelly, strain it thro' a Cloth; when settled, strain it again; then with this wash over your Work with a short Brush; if you think that will not be enough, give it a second, then *Varnish* it; but before you *Varnish*, if you think fit, you may Paint in *Oil* or *Water-Colours*, Flowers, Fruits, Leaves or Birds, &c. in their proper Colours, and *Varnish* them; having first laid them over with the former Jelly. N. B. You may mix with your *Gluten*, either *Milk*, or *Soap of Alicant*. *Ibid.*

34. Of Beautifying Picture-Frames, or other Wooden Work, with Green Leaves.

Take *Indigo*, and a little *Orpiment* ground with *Water*, which will be a little inclining towards a *Greenish Brown*, mixing with about half a Pint of your Colour, the quantity of a *Muscle-Shell* full of *Vitel* of *Eggs*, and as much *Size* as is requisite to make it stick: Having first laid your *White* in the same manner as if you were to *Gild*, with *Burnish'd Gold*; you shall then Paint the *Freezes* of your *Frame* with this *Brown* Colour, leaving untouch'd, the *Mouldings* which should be *Gilt* before with *Burnish'd Gold*: Your Work being thus prepared, you may either by *Pouncing* or otherwise, draw what you fancy; then with *Indigo* ground with *Water*, a little *Size*, and a drop of *Vitel*, you shall Draw your *Figures* or *Leaves*, which you shall shadow; and in shadowing *Sweeten*, heightening them with *Green*, viz. You shall take *Orpiment* well ground with the *Greenish Brown*, wherewith you laid your first *Layer* upon your *Frame*; then heighten it with *Orpiment* alone, ground with *Water* and *Size*, and a little drop of *Vitel* amongst your Colours, because it would dry in *Burnishing*; for the *Vitel* serves only to *Burnish* the easier; of which things, you may make an Experiment. But if you fancy to Paint your *Leaves*, &c. in *Oil*, you must *Burnish* the first *Layer* of *Greenish Brown*; then you shall Paint your *Leaves* with drying *Oil* boiled with *Litharge* of *Gold*; but instead of *Orpiment*, you may, if you will, work with *Masticot*. Ibid.

(44.) Observations of Adorning Wooden Work, by Inlaying, Embossing, and Carving.

1. Of Inlaying Wood with Mother of Pearl.

This may be done with *Mother of Pearl*, by breaking the *Shells*, and cutting them according to the *Figures* you design, letting in each Piece with *Formers* and *Gouges*, by cutting out the *Wood*. By this means, you may imitate all sorts of *Fruits*, &c. for you will find some *Purple*, others *Blue*, *Green*, *Yellow*, &c. so that if you would imitate a *Black Grape*, the *Leaf* of a *Tree*, or any *Fruit*, you may have a suitable Colour: Make a small hole thro' every Piece, pinning it with a small Piece of *Silver Wire* to make it stick fast; then take *Linseed-Oil* and *Orcanet*, rub it well, and wipe off the *Oil* clean; when dry, *Varnish* it with drying *Varnish*. Ibid.

2. Of Inlaying Wood, with a Composition which shall seem like Silver Threads.

You may make very fine Compartment-Work in Wood, which will seem to be Inlaid with *Silver Threads*: You must be provided with a Set of small Gouges, *Formers*, &c. which must be kept very sharp; with these you must cut your Design; and then take *Tin*, melt it, and add to it as much *Quicksilver*; stir it with a Stick; being Cold, put it into the Palm of your Hand; if it be too soft, add a little more *Tin*; grind this Composition with Water upon a Marble, put it into a Shell; keep this Composition to fill up the Engravings of Cuttings, which you have made with your Tools; when you have left it two or three Hours to dry, Polish it with your Hand, and it will look like *Silver*. By adding more *Quicksilver*, you will make a thinner Composition; which, with your Thumb, you may rub into the Work you have cut; till it be as bright as *Silver*; instead of *Tin*, you may mix *Silver Foil* with the *Quicksilver*, which will add to the Beauty of your Work. This is commonly practised upon *Black* and *Coloured Wood*, Polishing them with a *Dent*.

If you would have the Composition more Beautiful, grind *Crystall*, and Wash it till it leaves the Water clear; then mix it in a Shell with some Gum; and with a Pencil fill up the Engravings; after three or four Hours drying, quicken it with the Composition of *Quicksilver* and *Silver Foil*.

3. Of Inlaying Wooden Utensils, as Boxes, Cabinets, &c. with hard Wax.

When you have with a Pencil, Drawn what pleaseth your fancy upon your Work, as *Birds*, *Beasts*, *Flies*, *Flowers*, *Fruits*, *Leaves*, *Travels*, *Anticks*, *Letters*, &c. Then take little *Knives* ground sharp at the Points; and Cut or Grave out the Work pretty deep which you have Drawn with your Pencil upon the Wood; when you have so done, lay upon the same some *Red*, *Green*, *Black*, *White*, *Yellow*, *Blue*, and what Colour'd hard Wax you please; and with a hot Iron, melt and rub hard the Wax all over into the *Crevices*, or Works which you have cut out, and so let it cool; then take such a Scraper as the Cabinet-makers use, and cleanse off the Wax to the Board, and when you shall have the Work which you drew to be very finely Inlayed of the Colour of your Wax, as tho' it were drawn with a Pen, and it will never Wash nor wear off; when you have scraped it clean, hold it a little to the Fire, and it will set a Gloss on it, and make it to shew much Pleasure. *Whit. Rich. Cab.*

4. Of Embossing or Moulding of Figures in Paste, to lay on Wooden Work.

Take the Crum of a New White Loaf, mould it till it become plyable and close as *Wax*, Rowl it with a Rowling-pin as far as 'twill go; then Print it in Moulds; when dry, 'twill be very hard; to preserve it from Vermin, mix *Aloes* with it.

Also, you may make a *Paste* with all sorts of *Powder* mix'd with *Mill dust*; as *Chalk*, *Azur*, *Ammel*, *Smalt*, *Red-Lead*, *Vermillion*, &c. Steep *Gum-Tragacanth* about Eight Days in *Water*, till it be very strong; with this, temper your *Powder*, and mould it in hollow Moulds of *Plaster*; being first oiled; when dry, they will seem *Wood* by their Excessive hardness. *Polish* them with a *Tooth*, or *Varnish* them, and they will be very strong, and serve for many uses; thus many *Foyners* Print off small *Figures*, to *Emboss* *Friezes*, or to set in the Nicks of hollow Places of their Work, or any where according to their Fancy; the more *Gum* you allow, the harder it will be. *Lemer. Mod. Curios.*

5. Of another Way of Embossing Wood Work in Moulds.

I remember (saith the Honourable Esq; *Boyl*) I began Trial to make an Approximation towards making of Embossed Works of *Wood* in Moulds, by the help of a strong and rare *Gluten*; which is thus made, by soaking the finest *Ichthyo-Colla* for Twenty Four, or at least Twelve Hours, in Spirit of *Wine*; the *menstruum* need not be high rectify'd, the common Spirit of *Wine* will do, unless it be for some particular uses. When by this Infusion, the Liquor has opened and softened the Body, both the Ingredients are very gently to be boiled together (and kept stirring, that the *Ichthyo-Colla* burn not, till all be reduced to a Liquor; save perhaps some strings, that are not perchance dissoluble) when 'tis boiled enough, a drop, suffered to cool, will soon turn to a very firm *Jelly*; and whilst 'tis hot, it should be strained through a piece of clean *Linnen*, into a *Glass* or other Vessel, that may be kept well stop'd; a gentle heat, suffices to melt it into a transparent Liquor, with little or no colour; and this fine thin *Gluten* holds so strongly, and binds so very fast, that having sometimes taken two ordinary square Trenchers and laid the one a pretty way over the other; a little of this Liquor, being put between them, and suffer'd to dry it self, united the Trenchers so fast, that when force, was employed to break them; it did it else where, and not where

they were joyned together. I have taken some common Saw-duft, and after having imbibed it with this Liquor, strained out what was superfluous, thro' a piece of *Linnen*, and shaped the rest with my Hand into a Ball; this negligent tryal, made the Ball after it had been leasurely dried, so hard, that being thrown several times against the Floor, it rebounded up without breaking: By this Method, *Foiners* having a *Paste* made with this Liquor, and fine *Saw-Dust* (or better with that *Lignous Powder* which they call *Pasty*) and then whilst it is in good Temper, it being put into Moulds of *Plaster* (as in the foregoing Num.) and when dry, your Figures which were moulded, will not only seem, but be real *Wood*; and if *Varnished* over, will be very Beautiful and durable. Use. *Nat. Phylos.*

9. Of Embossed or raised Work upon Wood, in Imitation of Japan.

To perform this, you must provide a very strong *Gum-Arabick Water*, and an Ounce of *Whiting*, and a quarter of an Ounce of the finest and best Boild *Armoniack*, grind them with *Gum-water* as fine as *Butter*, but so thin, that it may be drop'd from a Stick; the Stick should resemble a *Pencil Stick*, but more sharp and taper. This dip'd into your *Paste*, drop on your *Rock*, *Tree*, *Flower* or *House*, which you purpose to raise or *Emboss*; by repetition, proceed till it's raised as high and even as you think fit: If your *Paste* bladder, (which it sometimes will do for want of sufficient Grinding) it will, when it is dry, be full of holes; the way to prevent or cure which, is, with a wet fine Cloth, wrap'd about your Finger; rub it over again, and again, until the holes and cracks are quite fill'd up; when it is dry, Presle it with all imaginable care to make it smooth. You must farther observe, That in *Japan'd*, raised or *Embossed* Work for *Garments*, *Rocks*, &c. one part is Elevated above the other; as in *Flowers*, those that are nearest to the Eye, are highest; some Leaves too, that lie first, are higher than those that lie behind them: So in *Pleats* and *Folds* of *Garments*, those which seem to lie underneath, are always at the greatest distance. I will give one Instance more, and that is, of *Rocks*; where, in Position, the first must always surmount and swell beyond that which sculks behind, and is most remote; the Rule holds good in all things of the like Nature. I will here shew, two ways for its accomplishment.

First, after the design is raised to a due heighth, whether *Figure* or *Flower*, and well dried with a little *Gum-water*, *Vermilion*, and a *Pencil*, trace out the Out-Lines for the *Face*, *Hands*, or *Foldage* of the *Garments*, for the *Leaves* of

your *Plants* and *Seeds* of *Flowers*, or any thing intended in its proper shape, made before the raised Work was laid; according to which, your *Paste* was directed, and confined by those Lines that were drawn as its Boundaries; for unless such strokes were made, tis impossible to lay the *Paste* in its proper Figures. You must next procure you Three or Four small Instruments; one must be a bended Graver, the rest small pieces of *Steel*, in shape, like a *Carpenters Chisel*; the breadth of the largest, must not be above a quarter of an Inch, and the others, sizeably less; with these, your raised Work must be Cut, Scraped and Carved; leaving one part higher than the other, with due regard to the proportion of the thing you design: You must use a tender and light Hand in this Work; and your Tools very sharp, and smooth Edges; then smooth it with a *Brush* that hath been often used before; after this, you may cover it with what Metal you please.

The other way for raised Work is this; Trace out your design, as well the inside as the out, *i. e.* the shape of your Face, Neck, Hands, Legs; the chief strokes of the Foldings of the under and upper Garments; so of *Flowers* and the like: Then take your *Paste*, somewhat thinner than you commonly use it, and with it, raise the lower Garment or Parts which require the least raising. Let it dry thorowly; and then, with a small *Pencil*, dip'd in the thickest of your *Seed-Lack*, varnish just the edges of your raised Work; so that when you proceed to raise the higher part, it may hinder the wet, incorporating with the dry, which must be avoided. This must be repeated as oft as you Elevate one part above another; and still, as your Work is Exalted, your *Paste* must be thickned; when all is dry, if need require, *Prescle* it; and then it will be fit to receive your Metal. Make ready, then, what sort of Metal you please to cover it with, mixed in *Gum-water*, and with a *Pencil* for the purpose, lay it on full and fair on your raised Work; let it dry, and with a *Dogs Tooth Burnish* it till it is bright, and shines to your mind: Then dip the *Pencil* into the finest *Seed-Lack-Varnish*, and lay it over twice, then set it off, or shadow it with what your Fancy directs. If you should grind more *Paste* than you can consume at once, and it be dry before you have occasion for it a second time; if you grind it again, it will be fit for use. You may judge of the strength of your *Paste*, by the easy admittance of the Nail of your Finger, pressed hard upon it; for then 'tis too weak, and must be hardened and strengthened by a more strong *Gum-water*; Tryals and Experience will give you more satisfactory Directions. With these Ingredients, join'd to Art and Skill, it's possible to make a *Paste* so hard, that shall endure violent strokes with a *Hammer*, which shall neither break nor discompose it. *Stalk Treat. Fap.*

7. Of Carving or Engraving on Wood.

What you design to *Carve* on *Wood*, must first be drawn, traced, or Pasted on it; and all the rest of the *Wood*, except the Figure, must be cut away with little narrow pointed sharp and thin Knives made for that purpose. You must take special care, both in Cutting, and picking out what you have Cut, least you break any of it; which if you do, you will much deface it; and therefore, be sure to use a light and curious Hand.

The best *Wood* for this purpose, is *Box*, *Pear-Tree*, *Beech*, *Lime-Tree* and *Apple-Tree*. If your Carving be to Print from, it ought to be made very plain and smooth; and about an Inch thick.

To draw your Figure upon the *Wood*, grind white *Lead* very fine, and temper it with fair *Water*; dip a Cloth therein, and rub over one side of the *Wood*, and let it dry thoroughly: This keepeth the *Ink* (if you draw therewith) that it run not about, nor sink; if you draw with *Pastils*, it maketh the strokes appear more plain and bright.

Having whited the *Wood* as before (if it is a Figure you would Copy) *Black* or *Red* the backside of the Print or Copy, and with a little Stick or *Swallow's Quill*, trace over the strokes of the Figures.

You may *Paste* the Figure upon *Wood*, but then you need not white it over (for then the Figure will pill off) you must see that the *Wood* be well wrought and smooth; then wipe over the Printed side of the Figure with *Gum-Tragacanth* dissolved in *Limpid-water*, and lay it on smooth upon the *Wood*; which when thorowly dry, wet it a little all over, and fret off the Paper gently, till you can see perfectly every stroke of the Figure; dry it again, and fall to Cutting or Carving it.

Some affirm, That if you rub the *Wood* gently over with a ground of *Paste* made of the finest *Flower*, and then fix your draught or Copy upon it, and then suffering it to dry, rub the backside of it, which must be uppermost, with your wet Finger, till you crumble it off so thin, that the Print plainly appears upon the *Wood*. *Sal. Poligraph.*

8. Of Embossing Picture-Frames or other Wooden Work, with thick Paper or Lead.

Take a Plate of *Polish'd Steel*, which cover with that *Orange*, *Tawny Mineral*, call'd *Mine de Plomb*, Ground with *Linseed-Oil* and *Looking-Glass Tin*; so that drawing with an *Ivory Bodkin* upon the Painting, the Lines may be neat: Draw what you please; then harden the Painting, till it be

come of a *Tawny* Colour. Afterward, take *Aque-Fortis*, wherewith you shall be-sprinkle the Plate, letting it lie an Hour or Two. Your Plate being Graven and Cleansed, take a *Paper* as large as your Plate. and lay it upon the Plate; then put thereon, a piece of *Past-board*, which you shall adjust upon your first *Paper*, so that it may be Printed. You may do the same with thin *Lead*: Your *Paper* being well Printed, glew it upon your Frame; then Gild it with *Gold*, in *Oil*; and make the Field with *Lake* ground in *Oil*, or other Colour. You may fix on your Prints of *Lead*, with *Mastick*, and nail them with little Nails. *Lemer. Mod. Curios.*

9. *Of making a Paste to Mould or raise Carved Work, on Picture-Frames fit to Gild on.*

If you understand Modelling, or desire to make *Models* on which your *Moulds* shall be Cast; take good *Tough* well-tempered *Clay*, and with your Tools, model and work out any sort of Carving which you fancy; lay it to dry in the Shade; for either *Sun* or *Fire* will crack it. When it is dry and hard, and you intend to cast the *Moulds* on the *Models*; oil your *Models* over with *Linseed-Oil*; work the *Paste* briskly betwixt your Hands, clap it on, press it down close every where, that it may be perfect; and when it's dry, it's fit to Use.

To make the *Paste*; you must boil *Glue* in *Water*, and make it stronger than *Size*; yet something weaker than common *Glue*; bruise and mix *Whiting* very well with it, till it is as thick as *Dough*; knead it very stiffly, and wrap it up in a double Cloth; in which it may lie and receive some heat from the *Fire*; if you permit it to lie in the cold and harden, 'twill render it unserviceable. *Stat. Treat. Pap.*

10. *Of taking the Form of any Carved Frame, whereby to imitate in Paste any Carving.*

Take a piece of *Paste*, more or less, according to the length of the *Leaves* and *Flowers* you intend to take off; you need not (unless you please) take off the whole length of a *Frame*, for you will find one bunch of *Flowers*, perhaps Six or Eight times in one side of a *Frame*; so that one *Mould* may serve all that sort, provided they are Artificially United and Joined together: Work then the *Paste* between your Hands, and clap it on that part of the *Frame* which you design'd to take a *Mould* off; let there be *Paste* enough, that the back of the *Mould* be flat and even. While the *Mould* is warm, take it from the *Frame*; and at the same instant, with weak

weak *Glue*, fix it to a Board that is larger than it self. Thus may you take off any other small sort of Carving, not only from the inside and edge, but any part of a *Frame*; *Glewing* all your *Moulds* on little Boards, and give them leisure to dry and harden: Then you may proceed to placing your Embossed or Carved Work on *Frames*. Every *Joiner* can make *Frames* for this Work; which sometimes are very plain Mouldings; either half round, *Ogee*, or *Flat*; for there may be some hollow and *Ogee*, or what else you please, allowed of on the sides of the *Paste* Work. When your *Frames*, *Paste*, and *Moulds* are ready, do the *Moulds* well over with *Linseed-Oil*, striking the *Brush* into every little corner, for this prevents the *Moulds* sticking to the *Paste*: Then use as much warm *Paste* as will fill up the *Mould*; work it again, between your Hands; and whilst it is thus warm, and in good temper, put it into the *Mould*, pressing all parts with your Thumbs; Then with a Knife, cut off the superfluous *Paste*, even with the top of the *Mould*; turn out your newly Fashioned Carved Work on your Hands; and before it cools, glew it, and the place it is designed for, with thin *Glew*; clap it on your Work in the very place you intend it shall abide, pressing it gently. Then Oil your *Mould* again, work your *Paste*, Cast and place it as before: This must be repeated, till the whole be accomplished. Grant it four or five Days to dry in; after which time, you may safely whiten it. On these sort of *Frames*, you may Gild in Oil, or *Burnish*; but to the latter, it is chiefly accommodated. *Ibid.*

II. Of another way of Embossing Picture-Frames, or the like Fine Pieces of Work.

Soak a convenient quantity of whitish *Paper*, that is, not fine, about two or three days in *Water*, till it be very soft; then wash it in *Torrid Water*, and beat or work it in large *Mortars* or *Troughs* (much after the manner used in some places to Churn Butter) till it be brought to a kind of thin *Pap*, which must be laid on a *Sieve* (without pressure) to drain away the superfluous Humidity, and afterwards, put it into *Tepid Water*, wherein a good quantity of *Ichthy-Ocola*, or common *Size* has been dissolved: Being thence taken out by parcels with a *Sponge*, it must therewith (for the *Sponge* will dry up the superfluous moisture) be pressed into *Moulds* of *Iron*, or of such *Plaster* as Statuaries; wherein having acquired the *Figure* which is intended to be given it, it is thence to be taken out, and permitted to dry, and is to be strengthened, where need requires, with *Plaster*, or grated *Chalk* (made into *Pap* with *Water*) or some other convenient matter; and afterwards, having first been leisurely

leisurely dried, 'tis to be either Painted, or overlaid with Foliated Silver or Gold; as the Artist pleases. *Boil. Use. Nat. Philos.*

(45.) Observations, &c. of Gilding Wooden Work.

Our first Observations of this kind, shall be of *Gilding* any thing in *Oil*, whereby it may be safely exposed to the *Weather*: These Three things are necessary for *Gilding* in *Oil*, viz. *Primer*, fat *Oil*, and *Gold Size*. Of all which, we shall give you the infallibly true Experiments of making.

1. Of making Priming.

Priming, you may make of any Colour that hath a body; as white *Lead*, brown or *Red Oaker*, and *Umber*, ground in *Oil*, pretty light; but the *Painters* have the best conveniency for this Composition; for 'tis made of the scraping of their *Pots*, the oldest skinny Colours; and the cleansing or filth of their *Pencils*. All these being mixed, grind very well, put them into a *Canvas Bag* that will hold a Pint, sowed very strongly for this purpose: If the Colour be too dark, it may be alter'd, by adding a little *White Lead*; being securely inclosed and tied up, press it between a pair of *Skrews* such as *Apothecaries* use; now and then turning the *Bag*, untill all the fine *Primer* be squeezed out, which put in a *Gallipot*; the Skins and Filth that remains, are useless, and may be thrown away. With this, your piece must be very thinly *Primed* over, and permitted to dry. *Stalk. Treat. Fap.*

2. Of making Fat Oil.

Fat Oil, is nothing but *Linseed Oil*, put into *Leaden Vessels*, shaped like *Dripping-pans*; but so that the *Oil* may not be above an Inch deep; which set in the *Sun* for Five or Six Months, untill it be as thick as *Turpentine*; the longer it stands, the fater it will be; and by consequence, the *Gold* will acquire a better Gloss; if it arrive to the consistence of *Butter*, that it may be almost cut with a Knife; reserve it carefully, and as the best for use that can possible be made *Ibid. V. P. Num. 5.*

3. Of

3. *Of making Gold Size in Oil.*

Provide the best *Yellow Oker*, and let it be ground fine and thick with *Linseed-Oil*, which is something Fat. This done, put it into a *Pipkin*, and put on it, some fat *Oil*, to keep it from skinning over; cover it with *Paper*, or a *Bladder*, to defend it from Dust; and thus keep it for your use: You may use it presently; and if you keep it Seven Years, 'twill come to no danger; but on the contrary, be much better for your purpose. Should it happen, that you have old *Gold Size* that is skinny, and *Yellow* and *Brown Oker* in the same Condition; grind them, and shut them up in a clean *Canvas Bag*; press it between your *Skrew*, as your *Primer* was, until you have made a separation, and parted the good from the bad. This sort of *Gold Size*, is ready to to serve your present and most urgent occasions: If you desire to have a piece extraordinary, I advise you to prime it thinly over once more; allowing it Four or Five Days to dry, if your business will permit; if not, instead thereof, *Lacker* over your Work in the *Gold*, or some such moderate heat, and then 'tis rightly prepared for the reception of the *Gold Size*. Ibid.

4. *Of another way of making Size, for Gilding both with Gold and Silver.*

For to make *Gold-Size*, take *Yellow Oker*, and grind it on a *Stone* with *Water* till it be very fine, and afterwards lay it on a *Chalk Stone* to dry; this is the common way; but it is a better way to Wash it, which you must perform thus.

To Wash Colour.

Take what quantity of *Colour* you please to Wash, and put it into a Vessel of fair *Water*, and stir it about till the *Water* be all *Colour'd* with it; then if any filth swim on the top, scum it off clean; and when you think the grossest of the *Colour* is settled to the bottom, then pour off the *Water* into a second Vessel of Earth, that is large enough to contain the first Vessel full of *Water* four or five times; then pour more *Water* into the first Vessel, and stir the *Colour* that remains, till the *Water* be thick; and after it is a little settled, pour that *Water* also into the second Vessel, and fill the first Vessel again with *Water*, stirring it as before; do thus so often, till you find all the finest of the *Colour* drawn forth, and that none but coarse gritty stuff remains at the bottom; then
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let this *Water* in the second Vessel stand till it be clear, and that all the Colour be sunk to the bottom ; which when you perceive, then pour the *Water* from it, and reserve the Colour in the bottom, for use, which must be perfectly dried before you mix it with *Oil* to Work. So when you have thus Washed it, to be sure, none but the purest of the Colour will be used ; and besides, it is done with more ease, and less daubing. When your *Oil* and *Oaker* are thus prepared, you must grind them together, as you do *Oil* Colours, only with fat drying *Oil*, but it's something more laborious Work, and must be ground very fine, even as *Oil* it self ; for the finer it is, the greater lustre will your *Gold* have that is laid on it.

N. B. That you must give it such a quantity of your fat *Oil*, that it may not be so weak as to run when you have laid it on, nor so stiff, that it may not work well ; but of such a competent Body, that after it is laid on it may settle it self, smooth and glassy, which is the chief property of good *Size*. *Smi. Art. Paint.*

Silver Size.

The way of making *Silver Size*, is very little different from that of *Gold* ; for *Silver Size* is made, by grinding of fat drying *Oil* with *White Lead* ; some do add a very little *Yellow Oaker* to make it bind the better. *Ibid.*

Before I proceed any further, I shall here add some other Ways and Observations of making Fat and drying Oil.

5. Of Making drying Oil, after other Methods, than that Number 2.

To a Quart of *Linseed-Oil*, some observe to add two Ounces of the *Litharge* of *Lead*: powdered finely, before they put to the *Oil* ; and when they have mix'd it, set it on the *Fire* in an Earthen *Pan*, and let it boil for near an Hour, more or less, till the *Oil* be grown thick and Fat, and almost of the thickness of *Treacle* that comes from *Sugar* ; and then they set it a little on a *Fire*, and stir it well, and then put out the *Flame*, and let it stand till it be thorowly cold, and the *Litharge* will settle to the bottom ; pour off the clear, and keep it for use in a *Bladder* close tied, or a *Bottel* close stop'd.

In using such *Oil*, you must observe this Method, viz. When you mix up your Colours for working, put Three parts of plain *Linseed-Oil*, and One of this drying *Oil*, together in a *Pan*,

a *Pan*, and mix them well: with this temper your Colours. It is observed, that this drying *Oil*, doth not only make the Colours dry sooner than plain *Oil*, but it also adds a Beauty and Lustre to the Colours; so that they dry with a gloss, as if they had been *Varnished* over. *Ibid.*

Some *Painters*, to make their Colours dry, take *Crocus Veneris*, and having beaten it to *Powder*, burn it in a *Fire-shovel*, as some do burn *Allom*, i. e. they set it on the *Fire* till it is melted, and so they continue it till all the moisture be exhaled, and the matter remain a dry white *Cake*; some of this *Powder* being added to the Colours in grinding, will make the Colours dry very well. *Ibid.*

The way before mentioned of boiling *Lytharge* in *Oil*, makes it of a deep *Redish* Colour, which is an inconveniency, for it will be apt to make *White's Yellowish*, and *Blue's Greenish*. *Ibid.*

To prevent this, a drying *Oil* may be made, which shall be *White* and clear, after the following Method.

Put the forementioned quantity of *Linseed-Oil* to the like quantity of *Lytharge*; put the mixture into a *Glass*, and set it in the hot *Sun*, for a Month in the *Summer* time, stirring it well together once a Week, during the whole time; and you shall not fail in that time, to obtain an *Oil* very *white* and clear, (for the *Sun* takes away all Colour either from *Linseed*, or *Walnut-Oil*) but also in that time, it will become very fat and thick, and attain to a very drying quality.

By the same Methods, may *Nut Oil* be made to dry, as well as that of *Linseed*, it being prefer'd before that of *Linseed*, for all *white* Painting that is not exposed to the open *Air*; for 'tis an Observation, that in close places, *Linseed-Oil* is apt to make *white Lead* turn *Yellow*. *Ibid.*

N. B. It's an Observation worth noting; That if you steep *Ornato*, in clear well sunned *Linseed-Oil*, or *Oil* of *Walnuts*; it will ting the *Oil* of a delicate Golden Colour; which *Oil* so ting'd, exceeds all others for laying on of *Vermilion*, *Red Lead*, *Orpiment* and *Masticot*; to all which Colours it gives an excellent Lustre. *Ibid.*

It's another Observation also That all simple Colours used in House Painting, appear much more Beautiful and Lustrous, when they seem as if they were *Varnished*; to which, both the drying *Oil* before mentioned contributes very much, and also the *Oil* of *Turpentine*, which *Painters* use to make their Colours dry soon; but Experiments have taught us, that some good clear *Turpentine*, dissolved in the aforesaid *Oil* of *Turpentine*, before it be mix'd with the *Oil* Colours, shall make those Colours shine when dry, and preserve their Beauty; drying with an extream glassy surface, and much more smooth than *Oil* alone, and shall better resist the injuries of *Air* and *Weather*. *Ibid.*

6. Of mixing and laying on Gold-Size.

Take of the best *Gold-Size*, and of *Fat Oil*, an equal quantity, yet no more than your piece requires. Mix them well together on your *Grinding-Stone*, and put them into a *Por*; produce a clean *Brush* that has been formerly used, and with it, dip'd in the *Size*, pass over the piece very thinly, jobbing, and striking the point of the *Brush* into the hollow places of the *Carved Work* (if there be any *Carving* in your *Piece*) having done it carefully all over, set it by, where it may be free from *Dust* for *Twenty Four Hours*; the longer it stands, the better gloss your *Gold* or *Silver* will be adorned with, provided it be but clammy enough to hold your *Metals*. Now to consider the exact time when the *Gold Size* is fit to be *Gilded* on, breathe upon it: if your breath cover it like a *Mist*, 'tis evident, you may lay on your *Gold*; or otherwise, press your *Finger* upon it somewhat hard, and if you perceive it is so dry, that it will neither discolour, nor stick to your *Fingers*; but yet it is in some measure *Clammy*, and unwilling to part with it, conclude, 'tis in a good *Condition*. If you should attempt to *Gild* before the *Size* is dry enough, That moisture will drown and deprive your *Gold* of that *Gloss* and *Lustre*, which it would acquire if skilfully performed. On the contrary, if the *Size* is over dry, you have lost the opportunity, for it will not accept of the *Gold*. The first miscarriage of being too moist, is rectified, by letting it stand a day or two longer to dry; the latter, when it is too dry, must be remedied, by being confined one *Night* to a damp *Cellar*, and then without question it will receive the *Gold*. *Salk. Trea. Jap.*

7. Of laying on the Gold, and the Tools required for this purpose.

In the first place, procure a *Cushion* made of *Leather*, stuff'd very even with *Tow*, and strained on a *Board* Ten Inches one way, and Fourteen the other. On this, you are to cut your *Gold* and *Silver* with a sharp smooth-edged *Knife*. Secondly, Three or Four *Pencils* of finer *Hair* than ordinary: It's observed, that some *Artists* use a *Squirrels Tail* spread abroad, and fastened to a flat *Pencil Stick*, which is broad at one end, and split, just like a *House-Painter's Grinding Tool*; but less; it serves for taking up and laying on a whole *Foil* at a time, and is by them, call'd a *Pallet*. Thirdly, *Cotton* is also requisite, some use nothing else.

Next, Take your *Pencil* or *Cotton*, and breathe on it; with which, touch and take up your *Gold*, and lay it on the place you

you design it for, and press it down with your *Pencil* or *Cotton*. Thus proceed, till you have finished and overlaid the whole Piece. Then you may cut some *Leaves* into pieces, which may be to cover such places, as may have escaped *Gilding*. Having laid it aside for a Day, then take a fine *Hogs-Hair-Brush*; with this, job and beat over your Work gently, that the *Gold* may be pressed in close, into all the uneven and hollow parts of the Carving. (if you have any) Lastly, with fine soft *Shammy Leather*, as it were *Polish* and pass it over. If you manage it according to these *Observations*, 'twill appear with a good Lustre and Beauty, which will be durable against the Injuries of *Wind* and *Weather*, for many Ages. *Ibid.*

8. Of Gilding with Gold, either Letters or Figures, &c.

If you have occasion to *Gild* with *Gold Foil*, on an *Oily Size*, according to the usual Practice of *Painters*; there does then belong to this Work, several manual Tools; as first, a *Cushion*, upon which the *Foil* must be cut, into such Forms as fit the Work you are *Gilding*; this *Cushion* is generally made of smooth-grained *Baril Skin*, the *Fleshy* side outward; this is to be nailed to the edge of a square *Lignous* Bottom, about Six Inches square, and then well stuff'd out with *Cotton* or *Wool*, very hard, plain and flattish.

The second Instrument you must make use of, is, to cut the *Foil* with, which must be either a sharp smooth-edg'd *Casse-Knife*, or else a slip of hollow *Spannish-Cane*, brought to a smooth and sharp edge, with a *Penknife*; this *Cane-Knife* is counted best, because, if well made, it will not only be very sharp, but also cut the *Foil* more naturally than any other; for a *Steel Knife*, tho' it cut very well, yet it is observed, that the *Gold* will stick to it, except you be very careful to keep the edge very dry, by often wiping it with a clean, dry Cloth; whereas, a *Cane-Knife* will put you to no such trouble.

Your third Instrument must be a *Gilding Pallet*, which is only a flat piece of *Wood*, about three Inches long, and an Inch broad; upon which, must be glued, a fine piece of *Woollen Cloth*; when you have cut your *Foil* into proper scantlings, do but breathe upon your *Pallet*, that the *Cloth* may be made a little moist by it; then if you clap it down gently on the *Gold* that is cut out, it will stick to the *Pallet*, and may from thence be conveyed to your Work you are to *Gild*: This *Tool* is only for flat Work; in which case, you make it as large as a single *Foil*, if you are to cover a large quantity of Work; and then you may transfer it from the Book to the Work, without farther trouble.

You may also have a fourth Instrument, viz. a Pair of *Cane Pliers*, to take your *Foil* out of your Book, and place it on

on your *Cushion*. If you find that breathing upon the *Pal-
lat* will not make it humid enough; then draw it lightly
cross your Tongue; when you have by this means, convey'd
it to your *Size*, you must there press it down smooth with a
bunch of *Cotton* or a *Hares Foot*; when it's fully dry, brush
off the loose *Gold* with the *Hares Foot*; so will your *Gilding*
remain fair and beautiful.

N. B. That after your *Gilding* is perfectly laid on; you
may, if you please, *Diaper* or *Flourish* on it with thin calci-
ned *Umber*, whatever shall be suitable to your design: But
be sure to let your *Umber* be so thin, that the *Gold* may ap-
pear thro' it.

N. B. Further, That a Book of *Gold Foil*, contains Twen-
ty Four *Leaves*, each being Three *Inches* Square, and the
price of each Book is generally two *Shillings* at the *Gold-
Beaters*: One Book will cover Two Hundred and Sixteen
Superficial Inches of Work. The right understanding of this,
will very much guide you, in judging how many Books will
Gild that Work, whose *Superficial* content, may before hand
be known. *Smi. Art. Paint.*

9. Of Gilding of Silver.

In laying on *Silver* on an *Oily Size*; you must in all respects,
follow the Method delivered in the last *Observation*, for
Gilding with *Gold*, save only in this, that the *Size* upon
which the *Silver* is laid, ought to be compounded of a very
little *Yellow Oker*, and much *White Lead*; for the *Size* being
of a *White* Colour, the *Silver* laid on it will look more Na-
tural, and retain its own Colour better; the whiter the
Size is, *Ibid.*

N. B. That common *Painters* do now generally in *Gild-
ing*, use more *Silver* than *Gold*, in most Works that are not
much exposed to the Air; to which, they afterwards give
the Colour of *Gold*, by means of *Lacker-Varnish*. The *Ex-
periments* of making which, we shall shew; and also, how
to use it, according to the best *Experiments* and *Observations*
that have been made of late.

10. Of Lackering in Oil, such things as are exposed abroad, or to the Weather.

In performing this, you must observe the very same Method
prescribed before for *Gilding*, with this difference; that
your *Primer* be more white than that mentioned, Number the
First, which is effected, by mixing a little white *Lead*,
that has been ground a long time, amongst your *Gold Size*
Numb. Three. Farther considering, that your *Gold Size*
ought

ought not to be so dry as that of *Gold*, when the *Foil* is to be laid on. These two Remarks being rightly observed, go on with your *Experiment* in every particular aforesaid, and you cannot possibly miscarry. *Stat. Treas. 7a?*

11. Of preparing and Gilding Carved-Frames in Oil, that are not to expose Abroad.

Take *Size* and warm it pretty hot, and put in it as much *Whiting* made very fine, as will only make it of a fine *white* Colour: *Size* over your *Frame* once with it; then add more *Whiting*, until it is of a reasonable consistence and thickness; with this, lay it over three or four times, as you find it deserves, granting it time to dry well between every turn: Then take a fine *Fish-Skin*, or *Prescle*, and smooth your *Frame* with 'em; when you have so done, you may with a *Rag*, or your Finger dip'd in *Water*, smooth or *Water-plain* it to your mind; let it dry. After this, with a small quantity of strong *Size*, *Cold-clear* it, i. e. *Size* it over; when this is dried, *Lacker* over your Piece by a gentle *Tepor*, two several times. To conclude, lay on your *Gold Size*, and perform every thing required in the foregoing Instructions. *Ibid.*

12. Of Overlaying Wood with Burnish'd Gold and Silver.

In order to this *Parchment-Size* must be provided. Take Two Pound of the cuttings of clean *Parchment*; the *Scriveners* vend it for Three Pence a Pound; Wash, and put it into a Gallon of fair *Water*, boil it to a *Jelly*; then strain and suffer it to cool, and you will find it strong *Size*. This may be used in *White Japan* also, instead of *Ichthyocolla*. When you intend to imploy any of it about the Business in hand, put some into an *Earthen Pipkin*, make it very hot, remove it from the *Fire*, and scrape into it, as much *Whiting*, as may only Colour it; mingle and incorporate them well together with a clean *Brush*; with this, whiten your Work, jobbing and striking your *Brush* against it; if it have any Carving in it, that the *Whiting* may enter into every private corner and hollowness, give it rest and leisure to dry. Mele *Size* again, and put in as much *Whiting* again, as will render it in some degree thick; with this, whiten it Seven or Eight times, or as you think best, never forgetting to let it thoroughly dry between every turn by the *Fire* or *Sun*; but after the last, before 'tis quite dry, dip a clean *Brush* in *Water*, and smooth it over gently, and *Prescle* it smooth when dry, if you find it necessary. In the next place, with a small *Gouge* no broader than a *Straw*, open the *Veins* of the

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Carved

Carved Work which your *Whiting* hath stopp'd up. Lastly, with a fine humid *Rag*, with which, and your *Finger*, gently with care, smooth and *Water-plane* it all over; and when 'tis dry, 'tis in a Capacity to receive your *Gold Size*; Of which, in the following Experiment.

13. Of Gold and Silver Size for Burnishing.

Gold-Size, is the chief Ingredient that is concern'd in this sort of *Gilding*; and 'tis a difficult Task to find the true quantity of each distinct thing that is required to make the Composition; and the reason of it is this; because you are compell'd to vary your proportions, as each Season changes its Qualities of Moisture and Dryth; for the *Summer* demands a stronger *Size* than *Winter*. The most experienced are uncertain, when they make the *Size*, whether 'twill answer their intentions, and suffer them to *Burnish* on it; therefore, to know how 'twill endure, they lay some of it on a corner of a *Frame*, and cover it with *Gold* or *Silver*: Now if it does not *Burnish* well, but is rough, and inclined to scratch, add more *Grease* and *Oil*, yet avoid too large a quantity: And seeing 'tis no easy matter to hit right, and nick the due required mixture, I shall lay down several ways to make it, which I have not only experimented my self, but are now practis'd by some of the chief Professors of it in *London*.

14. Of making the best Silver-Size for Burnishing.

Get some fine *Tobacco-Pipe Lutum*, grind it very small; if you please, mix as much *Lampblack*, as will turn it of a light *Ash* Colour; add to these, a small bit of *Candle Grease*, grind them together extraordinary fine, granting a mixture of *Size* and *Water*; then try it as before. v. Pl. Numb. 16.

15. Of the best Way of making Gold-Size for Burnishing.

Take of the best *English* and *French Armoniack*, an equal quantity, grind them very fine on a *Marble* with *Water*; then scrape into it a little *Candle-Grease*, incorporate and grind all well together. Again, mix a small quantity of *Parchment-Size*, with a double proportion of *Water*, and 'tis all concluded.

16. *Of another Silver-Size for Burnish'd Silver.*

Provide fine *Tobacco-Pipe Lutum*, grind a little *Black Lead*, and cast in some *Castile Soap*; Grind them all together, mixing them with a weak *Size*, as you were taught in the last account of making *Silver-Size*.

17. *Of another Size for Burnish'd Gold or Silver.*

Take two *Drams* of *Sallet Oil* and one *Dram* of *White Wax*, put 'em into a clean *Gally-Pot*, only dissolve them on the *Fire*; to these two *Drams* of *Black Lead*, and near a *Pound* of *Bole Armoniack*; grind all very fine together, mixing with them, *Size* and *Water*. Remember never to grind more *Gold* or *Silver-Size* than will serve your present necessity; for it will not be useful another time. In order to *Gold-Size* it, if the Subject you are to Work on be a *Carved Frame*, and you purpose to *Gild* it; take *Yellow Oaker*, grind it fine with *Water*, add a little weak *Size* to bind it; when warm'd, Colour over your *Frame*, pass by no part of it, permit it to dry leisurely.

18. *Of Laying on Gold-Size on a Frame, or any other Wooden Work.*

Employ either of the former *Gold Sizes*, yet I am rather inclined to the first; melt it, so that it be only blood warm; stir it well with a fine *Brush*, let it be somewhat thin; with this, *Size* over your Work twice, but touch not the hollow places or deepest parts of the *Carving* (if any such be in your Work) where you cannot conveniently lay your *Gold*; or the *Yellow* Colour first laid on, is nearer in Colour to the *Gold*; so that if in *Gilding*, you mix any, the fault will not be soon discover'd, Allow it four or five Hours to dry, and then try if the *Gold* will *Burnish* on it; if not, alter your *Gold-Size*, and do it over again; and when dry, then cover it with *Gold*, according to the directions in the following Experiment.

19. *Of laying on Gold for Burnishing.*

Having set your Work on an *Hasel*, or fix'd it in some other place, in an upright Posture, that the *Water* may run off, and not settle in any of the hollowness; lay some *Gold* oil on your *Cushion*, which you are to hold in your left Hand, with the *Pallat* and *Pencil*: Also it is convenient to have a *Basin* of *Water* by you, as likewise dry *Whiting* to rub your

Knife with sometimes, that the *Gold* may not cling to it. All these being advantageously placed, and in readiness, proceed in your Work: Produce then, a *Swans-Quill-Pencil*, or a larger *Tool* of *Camels-Hair*, if the Work require it; this being dip'd in *Water*, wet so much of your *Frame* as will take up Three or Four *Leaves*, beginning at the lower end, ascending and *Gilding* upwards, laying on whole *Foils* or half, as your Work calls for them for your own Interest, contriving how you may bestow them without waste; which is a thing of no small concern to a *Gilder*. Then wet such another part of your Work, and lay on your *Gold* with your *Pencil* or *Cotton*, pressing it close. Having by this Method, *Gilded* the two upright sides of your *Frame*, turn it, and proceed to Operate after the same manner with the remaining parts. After the *Gilding* of one side, examine your Work, to see what little Spots there are which have elcaped your *Pencil*: Cut some *Leaves* into small pieces, and with a small *Pencil*, wet the *ungilded* parts, and take up bits of *Gold* proportioned to the places; this last performance we call *Faulting*. These things being done, let it stand Twenty Four Hours, and no longer, especially in the *Summer*; for if you do, you'll find it will not *Burnish*.

20. Burnishing Gold or Silver.

A *Canine Tooth* was formerly lock'd upon as the fittest Instrument for this business; but of late, *Aggats* and *Pebbles* are more highly esteem'd, being formed into the same shapes; for it's observ'd, That they have finer Grain and Greet, which conduces to, and heightens the Luster of the *Gold*; and besides, they make a quicker dispatch. These *Pebbles* are valued at Five *Shillings* a piece. Having *Burnish'd* so much of your Work as you design, leave the ground of your Carving untouch'd, and some other parts as you think best; which being rough in respect of the other, sets off the *Burnishing*: That which is not *Burnish'd*, must be matted or secur'd with *Size*, *Seed-Lac-Varnish*, or *Lacker*, if you desire it deep Colour'd; let not your unsteady Hand run any of it upon the *Burnishing*. Then the Work must be set off or repress'd with *Lacker*, mixed in a *Gallipot*, with *Dragons Blood* and *Saffron*, or *Ornator*; into which, dip a fine *Pencil*, with which, touch the hollows of your Carving, the hollow *Veins* of the *Leaves* and *Foldage*; if you imagine it is not deep enough, make it so by a repetition: Some I know, use *Vermilion* in *Size*; but I declare, I am not reconciled to it, for'tis not so pleasant and agreeable to the *Eye*.

21. *Of laying on Silver-Size.*

Take *Silver-Size* that is newly ground, and mix with weak *Size*; warm it as your *Gold Size* was, and with a clean *Pen-cil*, of a bigness suitable to your Work; *Size* over the same once or twice; let it dry, and if your *Silver* will *burnish* on it, 'tis sufficient; but on the contrary, if it will not, you must alter it. Next wet your Work, lay on your *Silver-Foil* after the method for *Gold* directly, without any alteration, and *Burnish* it all over.

22. *Of some general Rules to be observed in Gilding.*

First, Let your *Parchment-Size* be somewhat strong, and keep it no considerable time by you; for 'twill not then be serviceable.

Secondly, Grind no more *Gold* or *Silver-Size*, than what may supply your present necessities.

Third, Preserve your Work clean and free from Dust, before and after it is *Gold fixed* and *Gilded*; otherwise, it will be full of scratches in *Burnishing*.

Lastly, Never attempt to *whiten Gold-Size* or *Burnish* it, in the time of a hard Frost; for your *Whiting* will be apt to peel off, and the *Gold* and *Silver-Size* will Freeze in laying on; not to say any thing of other misfortunes that attend the unseasonable Operation. *Ibid.*

23. *Of Priming for Burnish'd Gold, on Wood that is not exposed to the Weather.*

Make *Glew* of the cuttings of *White Leather* or *Vellum*, which Wash and Boil till it come to be of a good thickness, strain it thro' a Cloth: Take of this *Glew*, and add to it Three Ounces of *Water*; boil it, and while it is hot, strike over the *Wood*, being clean, with a *Brush*; do this three times, each course being first dry; last of all, give one laying, only of *Glew*, without *Water*; then take *Whiting*, grind or mix it in fair *Water*, let it be thick enough; then take your *Glew*, in which, put your *Whiting*, stirring it with a Stick till it is cold, taking special care, that it be neither too strong nor too weak; being, that on which the whole Work depends; take a little off in a *Pot*; to which, pour a little of the weak *Glew*, warm it a little at the *Fire*, that it be almost as clear as *Glew* alone; give a laying or two of this *White* upon your Work, leaving them to dry

one after another; then give a laying of *VWhite* a little thicker, taking care it be not too hot, which will occasion little holes or Blisters; use it therefore, when it is but just melted, laying it gently and smoothly on, working nimbly with the end of the *Brush* to stop the holes if any should happen; you may give from four to eight layings on, as you find cause; before the *VWhiting* be not too thick, for if you *Gild Carved* or *Embossed Work*, you will hide all the fine work of your Figure.

Being dry, repair it with a *Fish Skin*, then Prescle it; lastly, smooth it with a wet fine *Linnen Rag* or *Cloth*: It's an *Observation*, That the more even you make it, and the freer it is from little holes and knots, the more Beautiful will the *Gold* be; for the least defect in the *VWhite*, will be a great fault when *Gilt*. *Lemer. Mod. Curios.*

24. Of making Size to lay Gold on.

Take *Sanguine* or *Burnishing Stone*, the reddest is the best; grind it on a *Marble* with *Limpid VWater*, and to the quantity of a *Pencil* as big and as long as a Finger, add about half a *vitel*, which you must grind with it, adding the quantity of a great *Pea* of *white Soap*; then put your Colour in some *Pot*, adding a convenient quantity of *VWater*, till it become about the thickness of *Milk*, a little curdled, for it must not be laid too thick. *Ibid.*

25. Of laying on the foregoing Size.

Make tryal upon a piece of *Board* covered with a *white Ground*; when the *Size* is layed on, and it is dry, rub it with a *Linnen Cloth*. If the Colour stick to it, and leaves behind it upon your Work, only the *Flower* of the Colour of your *Size*, then 'tis good; but if you find it sticks not at all to your *Cloth*, put a little more *VWater* to it, because there is too much *vitel*; if then in rubbing it, your *Cloth* take off all the Colour from the *VWhite*; then add a little more *vitel*, mixing them well together, and make another tryal, and if you find it in fit temper, cover your Work, and leave it to dry; when you would lay on the *Gold*, wet the place first with a large *Pencil*; letting a drop or two run betwixt the *Gold-Foil* and the *Size*, leaving it accordingly, that it may run; then leave it to dry; before you burnish the whole, try upon a corner; if it do not peel, you may proceed: When you have *Burnish'd* it, you must rub it with a *Cloth*; if any of it chance not to stick, dissolve a very little of your *Vellom Glep* in a little *VWater*, by warming it; touch the place and it

it is done, take care that no greasy *Cloth* or Hands touch the *Gold*.

26. Of another more easy sort of *Gold* or *Silver-Size*.

Take *Yellow Oaker* of *Berry* (*English* is as good) provided it be not *Stony* or *Sandy*, wrap it in a *Linnen Cloth*, and tie it up, and burn it in the *Fire*, till from *Yellow*, it become of a *Red Colour*; let the *Fire* penetrate all parts of it; have a care also, that the *Fire* be not too sharp, then grind it well with *Size*, and if it will not easily burnish, add a little *vitel* to it, and a very little *White-Soap*, and grind them together. *Ibid.*

27. Of *Gilding Carved or Embelish'd Figures*, so that none of the fine *Stroaks* be lost in your *Work*.

Having with boiling *Glew* wash'd over your *Figures*, give it *Three* or *Four Courses* of *Whiting* very even; being dry, mix your *Size* as before directed, and lay it on: being dry, *Burnish* it; then take *Shell-Gold*, or *Silver*, tempered with weak *Gum-Tragacanth-Water*, or *Arabick*; cover your *Work* with it, and *Burnish* it with a *Dent*. Note, That you may lay on *Gold* or *Silver* with one course of *Whiting*, if it be *Pencil-Gold* or *Silver*. *Ibid.*

28. Of *Gilding in Oyl upon Black Wooden Work*, as *Picture-Frames* or the like; whereby the *Gold* appears very *Fair*.

Having your *Work* laid with *White*, *Black* and *Burnish*, according to the *Directions* in *Numb. Twenty Four*, *Twenty Five*, or *Twenty Six*, foregoing of the *Forty Third Observation* of *Colouring Woods*: Take *Gold Colour*, and with your *Pencil*, which must be very long and fine, *Paint* what you intend to *Gild*, be it *Leaves* or what you will; which you may afterwards hatch with a *Pencil*; when it is dry, as it ought, lay on your *Gold*, as exactly as you can; then with a *Feather*, brush off the *Gold* that does not stick. By this *Method*, you may have *Branched*, or *Moresk Works* very *Compleat*, for the *Gold* will not stick on the *Ground* that hath been *Burnish'd*; your *Gold Colour* must be good, or else you will not attain your *Design*. If you would represent *Birds* or other *Figures*, you may lay them with your *Pencil*; then being *Gilt*, draw them with a *Pencil* of *Black*.

in Oil, and hatch the Shadows with a Pencil as neatly as possible. The French used to make Frames hatched in this manner, which seem'd to be of Copper, Gilt and Engraven. But you must observe to hatch the Shadows upon the Figures. *Ibid.*

29. Of Drawing or Gilding Figures with Shell-Gold upon a Black Ground.

You may with Shell-Gold or Silver, make Grotesk or Branched Works or Figures, upon Wood, blackned as before, *Observ.* Forty three, Numb. Twenty Four, Twenty Five, or Twenty Six; always heightening the Work, and shadowing it, as the nature of the thing requires. The Gold may be burnish'd with a Canine Dent; especially, if it be Grotesk, and other branched Works, which are liable to be shadowed; so that having the Frieze of a Picture-Frame, cover it with White, and then blackned and well burnish'd, drawing thereon, Moresk works, with Shell Gold or Silver, your Gold being thick enough; and afterwards burnishing it with a Canine Dent, your Work will appear very well, provided ye work neatly. *Ibid.*

30. Of laying on Pencil Gold or Silver on Wood.

Temper Gold or Silver with weak Gum-*Tragacanth*-Water, very limpid, with a Pencil lay it on the lights of your Works, without touching the Shadows, which must be made with Indigo Ground, with very weak Gum-Arabick-Water; then Varnish it with drying Varnish, made of Spike-Oyl and Gum-Sandrac; if it be too thick, add some Oil in making it; let it not have a greater heat than may be endured by the Hands. Black Wood, or Wood so dyed or Colour'd, is most proper to Gild on. *Ibid.*

31. Of making Wood of the Colour of Gold, Silver, Copper or Brass.

Take Rock Crystal, beat it very fine in a Mortar; then grind it on a Marble with limpid Water; then put it in an Earthen Pot with a little Glew, warm it, and lay it on; when its dry, give it another laying, if need require it; when its thro' dry, rub it with Gold and Silver, Copper or Brass, and it will be of the same Colour you rub it with, then Polish it. *Ibid.*

32. *Of Grinding Gold to lay on any Figures
or Wood.*

Reduce a piece of *Gold* into small *File-Dust*, grind it on a *Marble*; when thoroughly ground, Wash it in a *Shell*, till the *Water* be clear; then with *Glew* or *Gum*, lay it on the *Size*, as you did *Burnish'd Gold*: You may also melt *Gold* with *Quick-Silver*, and then evaporate the *Quick-Silver* by increasing the heat, and when it is cold, beat it in a *Mortar*; then grind it, and lay it upon the *Size* as you did *burnish'd Gold*, and then burnish it. *Ibid.*

33. *Of Gilding Wood with Tin Foil, that shall
near resemble Gold.*

I Gilded an *Octagon Looking-Glass-Frame*, with a thick sort of *Tin Foil*; the *Ground* or *Size* that I laid it on, was not only pretty thick (but very hot) *Gluten*; when it had been laid on about *Twenty Four Hours*, I took an *Ivory* haft of a *Knife*, and burnished the *Tin Foil* over (it's a query, whether a well *Polished Burnisher* would not be better) then I took some *Emery* and a fine *Linnen Rag*, and *Polish'd* it with that; then having so done, I set a *Gloss* on it with another fine *Linnen Rag* which had been dip'd in *Putty*; then having warmed the *Frame* by the *Fire*, I *Lacker'd* it over *Six* times with *Gold-Lacker-Varnish*, warming it by the *Fire* after each *Washing*: This without more ado, did very much resemble *Lackering* on *Silver*; nay, I think it did appear more *Lustrous* and *Rich* than *Lackering* on *Silver* without *Burnishing* (for I compared it with some such which I had newly done) and in the *Eyes* of the *Vulgar*, it would pass for *Burnish'd Gold*. *Per Authorem.*

34. *Of an Excellent way to Gild with Silver
upon Wood.*

Take *Silver*, in *Froth* or *Scum*, which the *Refiners* use to separate from *Gold*, in *Washing* the *Sweep* of *Goldsmiths*; Grind this *Silver*, *Gum* it a little, and lay it on your *Work*, and when it's thorowly dry, burnish it, and you'll find your *Work* well *Silver'd*, being laid on a *white Ground*, and the *Size* used, *Numb. Fourty Four* of the *Forty Fifth Observ.* 'twill be very fine, appearing like *Massy Silver*. *Mod. Curios.*

35. *Of making Wood of a Silver Colour.*

Beat *Tin-glass* in a *Mortar* to fine *Powder*; then put some *Water* to it, and grind it very fine on a *White Marble*; then put it into an *Earthen Pan*, *Washing* it two or three times till it be very clean; mix it with clear *Gluten*, and lay it upon the *Wood*; being first warmed, and then layed on with a *Pencil*; when it is dry, *Polish* it with a *Dent*. This may be used, by only laying it on a *white Ground*, but burnish your *white* before you lay on your *Tin Glass*; and afterwards, with a *Paper* between the *Dent* and the *Tin-Glass*. *Ibid.*

36. *Of making Bronze or Powder, of the Colour of Gold, to lay on Wood, &c.*

Take *Gum-Elemi*, Twelve *Drams*, melt it, and crude *Quick-Silver*, One *Ounce*, and *Sal Armoniack* Two *Ounces*; put all in a *Glass*, with *Bole* and *Glair of Eggs*; then melt it all together; when melted, add as much *Orpiment*, as you think will bring it to a good *Colour*, and some *Filings of Brass*; being well mingled together; then with a *Pencil*, lay it on your *Work*. *Ibid.*

37. *Of making Bronze with Brass.*

Take *Pin-Dust*, grind it well, and *Wash* it till the *Water* be quite *Limpid*, mix it with *Gluten* as you did the *Tin-Glass* (*Numb. Thirty Five*) lay it on the the *white Ground* with a *Pencil*, and burnish it. The same may be done with *Antimony*. *Ibid.*

38. *Of making Bronze, to Imitate what Metal you please.*

Your *Wood* being whited and made smooth, grind *Cristal* and *Touchstone* with *Water*, temper it with *Gluten*, and lay it on your *Work*; and instead of *Burnishing*, rub it over with that *Metal* that you would imitate, and if you rub it well, the *Experiment* will take effect well, and be very neat. *Ibid.*

(46.) *Experim.*

(46.) Experiments and Observations on making of Varnishes, and of Varnishing.

I. Of making a Japan or China-Varnish.

Take *Spirit of Wine*, a Pint exquisitely, dephlegm'd *Gum-Lacq.* Four *Ounces*, which you must thus cleanse; break it first from the Sticks and rubbish, and then roughly concuss it in a *Mortar*; put it a steep in fountain *Water*, tied up in a *Bag* of course *Linnen*, with a small morsel of the best *Castile Soap*, for Twelve Hours; then rub out all the *Tincture* from it; to which, add a little *Allum*, and reserve it a part; the *Gum Lacq.* remaining in the *Bag*, with One *Ounce* of *Jandrack* (some add as much *Mastick* and *White Amber*) dissolve it in a large *Metras*, well stop'd with the *Spirit of Wine*, by a Two days Digestion, often agitating, that it do not adhere to the sides of the Vessel; then strain it, and press it forth into a lesser Vessel, and keep it for use, which will be eternal, if well stop'd. *Silva.*

2. Of making Indian Varnish, or Vernix Japonica, by another Process.

Take the best *Gum-Lac* in fine Powder, Eight *Ounces*, and the best rectified *Spirit of Wine*, Sixteen *Ounces*; mix them well, by strongly shaking them in a *Glass*, so long, till the *Spirit of Wine* has dissolv'd the *Lac*; digest it two Days, and the *Varnish* will be finished.

N. B. First. That this *Varnish* being laid on any thing, immediately dries.

Second, That it ought to be continually laid on, till it is thick enough, and the superficies equal and smooth.

Third, That the best time to use it, is in *April* or *May*, in a clear Sun-shining-day; and then afterwards, dried in a gentle heat for Six Days, before you attempt to *Polish* it.

Fourth, That *Varnished* things may be made smooth and even, by rubbing them with a *Pumice Stone* and *Oil-Olive*.

Fifth, That their Superficies be then *Polished*, by farther rubbing them with *Chalk* or *Putty*; in so doing, they will shine, and look like *Glass*.

Sixth, That it may be laid over any Colour you please; by which means, the Colour will look much more splendid.

Seventh, That you may mix the Colour with the *Varnish*; being first made into impalpable Powder, and either moistened with rectified *Spirit of Wine*, or its *Tincture* extracted therewith, if it will yield a *Tincture*, and so mixed with the *Varnish*.

Eighth,

Eighth, That *Sanguis Draconis*, Red Sanders, and some other Colour'd Bodies which will yield a Tincture, may be first mixed with the *Lac*; and so the *Varnish* be made and Colour'd all at once, by mixing with the said rectified Spirit of *Wine*.

Ninth, That being upon Leaves of Metal and Gold, Silver, Tin, Copper; it makes them look much more glorious, and preserves them so.

Tenth, That it ought to be used before a Fire, or in the tepid Sun Beams, or else it will be apt to chil, and your Work will be Cloudy and dull. *Sal. Poligr.*

3. Of making Indian Varnish fit to be used about Cabinets, Coaches, and such like Work.

Take the highest rectified Spirit of *Wine*, a Quart; Seed or Shell-Lac Five Ounces; put it into a Glass, and dissolve it in *Balneo* (but take care that the *Water* in *Balneum* do not boil, for that will turn the *Varnish* White) this done, strain it thro' a Flannel Bag and keep it in a Glass Bottle for use; but besure it be close stop'd.

N. B. First, If the Spirit of *Wine*, be good, it will (if you put Gun-Powder into it) burn all away, and Fire the Gun-Powder.

Second, That this *Varnish* laid on Silver Foil, will turn it of a Gold Colour; for it is the same *Varnish* which Coach-makers, and House Painters, &c. use in Building.

Third, That it preserves Silver that it is laid upon, from the injuries of the Air.

Fourth, That being laid on any Colour, it makes it look infinitely more rich and beautiful.

Fifth, That if it lies rough, you may Polish it with the impalpable Powder of *Emery* and *Water*. *Ibid.*

4. Of making Seed-Lack-Varnish.

Take a Gallon of good Spirit of *Wine*, and put it into as wide-a-mouth'd Bottle as you can procure; or else when you come to strain it, the Gum will clog a narrow mouth'd one. To your Spirit of *Wine*, add One Pound and half of the best Seed Lack-Varnish, which you shall thus choose; let it be large grain'd, bright and clear, free from Dust, and Sticks and Dross; let it stand Twenty Four Hours, or longer, for the Gum will be the better dissolv'd: Observe to shake it well together, and often to keep the Gum from clogging or caking together. When it hath stood its time, take another Bottle of the same bigness, or as many Quart ones, as will contain your *Varnish*; you must have a Strainer to strain it

it thro'; you ought indeed, to have two *Strainers*; one for *White*, and the other for *Lac-Varnish* and *Lackers*; these *Strainers* must be made of pretty fine *Flannel*, or ordinary course *Linnen*, in shape like a *Tunnel*, or *Sugar-Loafe*, or *Jelly-Bag*, that *Women* strain their *Jellies* thro'; your *Gums* being dissolv'd, you must fasten it to a *Tenter-Hook* against the Wall, in such a Posture, that the end of your *Strainer*, may almost reach the bottom of your *Tin-Tunnel*, which must be put in the Nose of your Empty Bottle; then shake your *Varnish* well together, and decant as much into your *Strainer* as it will conveniently hold; only leave room for your Hand, to squeez out the *Varnish* from the *Dregs* of the *Gums*; when you have in this manner strain'd it, stop it up close in the Bottles, and so let it rest two or three days, and then decant gently, the top of your *Varnish* into another clean Bottle, as long as you see it run clear, and no longer; and then give it time to rest a day or two more, and then you may decant off some more clear *Varnish*; having so done, you may keep it for use: You may make *Varnish* in less time than Twenty Four Hours, and use it immediately; but the other is the best way. Besides, the *Varnish* which you have from the top, is of extraordinary use, to adorn your Work, and render it Glossy and Beautiful. Some will boil *Lacker* and *Varnish*; but it is prejudicial to the things themselves; and it is as well, and better made without it.

5. Of making Shell-Lac-Varnish.

This *Varnish* is not proper, for neat Glossy Pieces of Work; but it is commonly used by those that *Varnish* ordinary *Woods*; as also *Olive*, *Walnut*, or the like. To proceed to the Method of making it; you must materate One half Pound of the best *Shell-Lack* (which is that, which is transparent and thinnest; and that, which if melted with a Candle, will draw out in the longest and finest hair (like melted *Wax*) because the toughest) in a Gallon of the best *Spirit of Wine*; this must be well stirred and shaken together, and should stand about Twenty Four Hours before 'tis strained; the *Seed-Lac-Varnish* hath much Sediment in it; on the contrary, this hath none, for it dissolves; and is by consequence, free from all *Dregs* and *Fæcies*; however, 'tis requisite to strain it, that the *Straws* and *Sticks* which are in the *Gum*, may be separated from the *Varnish*: But tho' it admits of no Sediment, and in this differs from the *Seed-Lac-Varnish*; yet 'tis observed, to be much inferior to it, in that it will not be fine and clear. This small advantage however, attends it, *viz.* That the same minute that made it, made it fit for use: And tho' it may be Polish'd, yet in a few days, it would be misty and dull. Your common *Varnishers*, frequently use it; for 'tis doubly advantageous to them, having a greater Body than *Seed-Lac*, less Labour and *Varnish* goes to

to perfecting their Work, and this will look tolerably bright for a small time: But d. q. it with a Pint of this *Varnish*, you mix two Ounces or more *Venice-Botin*, it will harden well, and be a *Varnish* good enough for inside of *Drawers*, *Frames of Tables*, *Stan-Pillars*, *Frames of Chairs*, and *Stools*, or the like. *Painters Lacker* may be made also with this *Varnish*, and a something larger quantity of the *Botin* put to it, it serves very well for *Lackering of Coaches*, *Houses*, *Signs*, or the like and will gloss with a very little *Ardor*; and if occasion be, without. *Ibid.*

6. Of making the Best White Varnish.

Take a Pound of the whitest *Gum-Sandrick*, One Ounce of the whitest *Gum-Mastick*; of the clearest *Venice-Botin*, Three Ounces; One Ounce and half of *Gum-Capal*; of *Gum-Elemni* half an Ounce, of *Gum-Benjamin* the clearest, half an Ounce; and One Ounce and half of the clearest *Gum-Anime*, and of *White Rosin* half an Ounce. The Gums being in their due quantities provided; you must put the *Capal* and *Rosin* in a *Glass-Vial*, with half a Pint of *Spirit of VVine* to dissolve them: In another *Glass*, put the *Anime*, *Benjamin*, and *Venice-Botin*, with three quarters of a Pint of *Spirit of VVine*. The *Sandrick* and *Mastick*, put into another *Bottle*, with a Pint and half of *Spirit of VVine*, and d. q. and the *Elemni* by it self, with a quarter of a Pint of *Spirit of VVine* to dissolve it. 'Tis not highly necessary, that you observe the quantities of the *Spirit of VVine* exactly; but it is convenient, that all your *Spirit of VVine* exceed not three Quarts. They must be dissolved in this manner, the better to extract the whole Virtue of each Gum, and prevent their clogging and caking together, which would much hinder their being quickly and thoroughly dissolved. You must observe, That the *Anime* and *Benjamin*, be reduced to very fine Powder, before they are mix'd with the *Spirit of VVine*: You may also bruise the *Capal* and *Rosin*; as for the rest, you may put them in the *Spirit of VVine* as you Buy them. Having thus carefully mix'd them, let them stand two or three days, often shaking each *Bottle*, viz. once in Two Hours, for the first; however, the remaining time, you may shake them at your own convenience: Then take a *Bottle* large enough to hold all the *Varnish*, and thro' a fine *Linnen Strainer*, strain all your Gums; but squeeze gently, and not with so close a Hand as is required for your *Seed-Lac*; for by this easy Percolation, you may prevent Sandy, Gritty stuff, passing into your *Varnish*; some never strain it, but with great diligence, pour it off as long as 'twill run clear from each *Bottle*. But if I may be a Competent Judge; this is not so good a way, nor so convenient, according to my Observations, and that for these following Reasons. And,

First, You have not so much *Varnish*.

Second,

Second, Neither can you pour it off so clear, and fine as you may by straining.

Third, Again, your *Dregs* being left in the Bottles, by frequent use will fill them up, and the recent *Gums* will mix with the old, and slackens the melting of them: All which our method disallows of, and keeps the Bottles empty, and fit for the same repeated use, without any of these inconveniencies.

But to proceed to our method, the *Varnish* being strained, and having stood Three or Four Days (the longer the better) pour off gently, as much as will come very clear; reserving the thick and muddy part at the bottom for ordinary uses, viz. as mixing with other *Varnish* for Black Work, or to gloss the inside of Boxes. Ibid.

7. Of making White Varnish, much Inferiour to the former.

Take three quarters of a Pound of Gum-Sandrick, mix it with two Quarts of Spirit of Vine; and having been well shaken, and stood for, about two days; decant or strain it into another Bottle, and reserve it for use.

Take also, clean pick'd Mastick, the same proportion to an equal quantity of Spirit of Vine, with the former, and in every particular, observe the rules for making the Sandrick, as to setting, shaking, decanting, and straining it.

Now when you design to Varnish a Print or any thing else with this Varnish; you must put but half so much Sandrick as your Mastick; d. q. if your Work will consume three quarters of a Pint, then you must take half a Pint of Mastick to a quarter of a Pint of Sandrick. From our Observations, we think it the best way to make the Varnishes separate, and so mix them, that we may have the Varnish answer to our designs, in softness or hardness.

When you have set by your Work for two Days, you may try its qualities; if by pressing your warm Finger upon it, you leave a print behind, 'tis a sign, that it is too soft, and a Wash or Two of Sandrick, will harden it; if it not only resist your touch, but hath some streaks, flaws or Creaks, like scratches; you may be sure 'tis too hard, and must be remedied by a Wash or two of your Mastick Varnish. Some dissolve these Gums together, and others mix them before hand; and by so doing, are not certain how their Varnish will succeed; for it's an Observation, That some parts of each Gums, are softer than others; and the contrary, should therefore a Varnish'd piece prove too soft, or too hard; this way cannot remedy it. Ibid. V. P. Num. 10.

8. *Of making a Varnish that will secure a Draught, whether Gold-Work or Colour, from the injuries of Tarnishing, and will give it a Gloss.*

In the First place, you must procure good *Venice-Botin*, which you must thus prepare; inclose it in a *Pipkin* that will hold double the quantity that you put in: And having prepared a *Fire* that will not flame out, but burn gently and clear, set your *Pot* over it, but be cautious that it does not boil over; stir it often with a little *Stick*, till you find it is fit for use; which you may discover, by dropping a little of it on the *Ground*; for when it is cool, 'twill crumble to *Powder* betwixt your *Fingers*, if it be sufficiently boiled; and when you find it so, let it cool, and preserve it for the following Composition. For this *Securing Varnish*, Take a quarter of a *Pint* of the finest *Seed-Lac-Varnish* (which is always the top of it) and one *Ounce* of your boil'd *Botin*, finely Powdered; put them both into a double *Glass Vial*, capacious enough to contain a double quantity; which being close stop'd, place it over a gentle *Fire*, that it may leisurely heat, to prevent the danger of breaking the *Glass*; which it is certainly past when it is exceeding hot; in this Condition, keep it simmering for some time; then take it off, and give it vent, by unstopping; having so done, return the stopple and shake it well, and place it on the *Fire* again, never discontinuing the Operation; but repeat the foresaid Method, till your *Botin* shall be so far dissolved, that the bigness of a large *Pea* only remains visible, for that being the Dross and indissoluble part, will not be incorporated. Being arrived to this degree, remove it from the *Fire*, and afford it two Days to cool and settle, and then put the clearest of it in a clean *Bottle*, to keep for use. Thus far of making it; now we will proceed to *Observations* of its use.

First, Whatsoever you propose to be secured by this *Varnish*, if your conveniency will admit of it, it should be destin'd to a warm place, that it may dry the sooner; if you cannot allow of it, then give it half an *Hours* space to dry between every *Wash*; however it will gloss either way.

Second, Then take a *Pencil*, for great Work, let it be large, *e contra*, proportionable to your *Draught*; with this, dip'd in *Varnish*, pass it over, *Leaf* by *Leaf*, and *Spring* by *Spring*; not forgetting to give your *Rocks* and other *Figures*, the like Entertainment; but besure observe, That your steady *Hand* never trespass upon your *Black Ground Work*.

Third, Having run over all your *Draught* thus, three or four times; for oftener, may spoil the *Colour* of your *Metal*; you may be satisfied, That your Undertaking (whether of *Gum-Water* or *Gold-Size*) is Armed against all In-

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juries and *Tarnish*; and if performed Artist-like, adds to the native Lustre of the Metals, with an Artificial Gloss, more bright and durable. *Ibid.*

9. Of Composing a Varnish to secure a whole Piece of Japanning, both Draught and Ground Work; whereby it may Endure Polishing and obtain the Gloss all over, like some of the Oriental Performances.

That necessary Ingredient *Venice Botin*, must here also be Employed; put a Pound of it, with three Pints of *Water*, into a clean Earthen *Pipkin*, large enough to contain near as much more: Place this over a gentle *Fire*, and by degrees, warm it, till it begins to simmer; then stir it with a Stick (as in the last *Experiment*) be careful it do not boil over, but still keep it leisurely boiling. If you find, when a little of this Liquor hath been pour'd on the Ground, and cold, it may be reduced to Powder between your Fingers; you may then conclude it is boiled enough. When it hath stood till it is cool enough for you to handle, you may wet your Hands and take the *Botin* out of the *Water*, and squeeze it as free from it as you can, and roll it into the form of a *Ball*; and after a Day or two, pulverize it, and set it to dry, but not too near the *Fire*, which will melt it; and *d. q.* put it in a *Gally pot* to keep. This Operation is just like the former in this *Experiment*; but the two *Botins* differ in their Colours; for this is as *White* as *Paper*, and the last *Experiment*, as *Yellow* as *Amber*.

We will now proceed to compose the *Varnish*; you must put One Ounce of this Powder, to an half Pint of *Seed-Lac-Varnish*, into a Bottle, which will contain a Quart; it must be close stop'd. When it has stood a small time on an easy *Fire*. take it off, unstop, and shake it; besure to do so, till the *Botin* is dissolved to the size of a *Pea*; then let it stand two Days to settle; then decant the clearest, which will then be ready for your Work. Thus much of its Composition; now for its use.

First, Take a clean *Varnishing Pencil*, large or small, according to your Work; and dip it into a *Gally pot*, wherein you have put some of your *Varnish*; and when you take it out, stroake it against the side of the *Pot*, to prevent your Tool from being too full, which will cause it to lye thick and rough in some places: Thus you must Wash over your whole Work, both Draught and Ground, Five or Six times, as you see the *Gold* and *Metals* keep their Colours; gently warming, and thorowly drying it betwixt every Wash; indeed, it must be but just warm, for if it be more, 'twill ruine your Labour.

Second, Having observed these Rules, as also, That it be evenly and smoothly done, let it rest three or four Days, before you attempt any thing further upon it.

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Thirdly,

Thirdly, After this time is past, take some *Tripole*, scrape it with a piece of *Glass*, and a fine *Rag* dip'd in *Water*, and the pulveriz'd *Tripole*; with which, moderately, not too hard, nor too soft, rub it till it becomes smooth and polite; but if it should come so near your *Gold* or *Draught*, as to dissipate it, rub no more there, but let your aim be to render you *Ground* or *Black*, bright and sleek; for there your wavings and unevenness will be most discernable.

Fourthly, To take off the *Tripole*, take the softest *Sponge*, macerated in *Water*; and with this, cleanse, and with a clean *Cloth* or *Rag* to dry, and free it from the *Tripole* that remains.

Fifthly, But because this will not free the *Crevices* and fine *Lines* from it, mingle a little *Lampblack* with *Oil*, and do your *Work* over with it and then to fetch this off, labour and rub it well with a fine *Cloth*, till you have freed it from the *Oil* and *Lampblack*.

Sixth, And *d. q.* Take another clean fine *Rag*, and therewith, fricate it well, until a *Gloss* is acquir'd, and 'twill reflect an object like a *Mirror*. *Ibid.*

10. Of making another Excellent White Varnish.

Take of the best rectified *Spirit of Wine*; One half Pint of *Gum-Sandrick* and *Mastick*, ana Five Ounces; *Gum-Anise* One Ounce; scrape or cleanse the *Gums*, and pulverize them apart, and dissolve them in the *Spirit of Wine* in a gentle *Balneo*, not fully boiling; which will be done in about Eight Hours, stoping the *Bottle* in which the *Ingredients* are; when they are dissolved, keep them in the same *Bottle* close stop'd for use. So much of the *Experiment* of making the *Varnish*, we will proceed to the *Observations* on using it.

First, When you use it, put a little in a *Gally-pot*, stoping the rest close; lay it on with a fine *Tool* several times; letting it stand about an *Hour* before the *Fire*, betwixt each *Washing*.

Secondly, but if you use it upon *Paper*, you ought to prepare it first, thus. Take *Ichthy-scola*, and cut it in small pieces; One Ounce to half a Pint of *Fountain Water*, macerate it cold Twenty Four Hours; then pour off, and cast away that *Water*, and put to the remaining Matter, New *Fountain* or *Spring Water*, a Pint; make a perfect dissolution over a gentle heat, or in *Balneo*; and then put it into a *Gally-pot*, and keep it for use.

Thirdly, When you use it, heat it but just warm, and with a *Brush* of *Camels Hair*, being clean, wipe over your *Paper* (being first pasted upon a *Board*, and dried) then set it to dry, about half a *Yard* distant from the *Fire*, and when it is thro' dry, go over your *Paper* again in the same manner; [reiterating this last *Work*, till it look like *Glass*.

Fourthly,

Fourthly, This done, lay on the *Varnish*, according to *Numb.* the first, of using it.

Fifthly, And *d. q.* After three or four Days, or more, Polish it with impalpable Powder of *Tripoli*, *Emery*, or *Putty*, by help of a *Rag*, and a little Fair or Limped *Water*. *Polig.*

II. Of making an Universal Varnish, by some, reputed, the best of all others.

Take good *Gum-Sandrack* (but *Anime* is better) dissolve it in the highest rectified *Spirit of Wine* (One half Ounce more or less, to a Pint) and it is done. Where Note,

First, That unless the *Spirit of Wine* be good, the *Varnish* cannot be so.

Secondly, Some mix boiled *Botin* with it, others, *Chymical Oils* of deeper Colours (as of *Cloues*, *Mace*, *Nutmeges*, *Caraways*, *Cinamon*) according to the intent.

Thirdly, It ought to be kept in a *Glass Bottle* close stop'd, least it Curdle, and the *Gums* separate. *Ibid.*

12. Of making a good Varnish, that may be laid on Gold, Silver, Brass, Iron, Stone, Wood, Vellom, or Paper.

Take *Benjamin* finely pulveriz'd between two Papers, put it into a *Vial*, and cover it with *Spirit of Wine*, Four Fingers above it; let it stand three or four Days, then strain it, and it will be bright and shining, drying immediately, and retaining its brightness many Years.

N. B. First, If you *Varnish Gold*, or any thing Gilded with it, before the straining, you shou'd put in a few Blades of *Saffron* for Colours sake.

Secondly, If you lay it upon *Silver*, or any white thing, you must use the white part of *Benjamin* only. *Ibid.*

13. Of making a Varnish for Wood or Leather.

Take the Tincture of *Saffron* or *Turmerick*, in a Pint of *Spirit of Wine*, prepared *Gum Lac*, quantum satis; dissolve the *Gum* in the Tincture, and it is done.

N. B. That this *Varnish* may also be laid over *Silver* or *Gold*, or any thing which is exposed to the Air. *Ibid.*

14. Of making a good clear Varnish for Wood.

Take *Gum-Lack* and *Sandrack*, equal Parts ana, quantum satis; Mastic, half so much; blend them together (being first Pulveriz'd and sear'd) in a dry *Glass Bottle*, with pure, strong, and high rectified *Spirit of Wine*; let the *Spirit of Wine*, stand an Inch above the *Gums*. When it first settles, stop the *Bottle* close; in a few days, it will dissolve; but you must now and then shake it. This is the best *Varnish*, I have ever tried, saith Mr. J. B. an ingenious Country Gentleman. M S.

15. Of making the Italian Varnish.

Take *Venice-Botin*, pure and clear, Eight Ounces; Evaporate it, over a gentle Fire, till it is very hard and brittle; make it into subtil Powder, put upon it by degrees, Oil of *Botin*, and digest them so long together, till the Powder be dissolved; then pour off the clear from Fæces, and keep it for use. *Poligr.*

16. Of making Mastick Varnish.

Take Oil of *Botin*, as much as you please; put it over the Fire, and make it boil; then by degrees, put in Grains of *Mastick*, so long, till the Oil will dissolve no more: The Solution being cold, separate it from the Fæces, and keep it for use.

N. B. First, After the same manner, may *Gum-Sandrick-Varnish* be made.

Second, *Mastick-Varnish* is of good use, for preserving and setting off Pictures; and being laid upon things Gilded or Silver'd over, or laid over with the Leaves of any Metal, it preserves them, that they lose not their Colour or Gloss.

Thirdly, This Varnish differs not much from that in Number the Thirty Three following, for Painting in Oil. *Ibid.*

17. Of making a good Varnish of Anime in Oil.

If you take good *Gum-Anime* and dissolve it in rectified Oil of *Botin*, it will make a better Varnish than if it be dissolved in Spirit of Wine. *Doron, L. I. C. 3.*

18. Of making Amber-Varnish.

Take *Amber* in Powder, Q. L. moisten it with *Linseed-Oil*, or Oil of *Walnuts*; melt them together, till they acquire a Black Colour; then pour them forth upon a little *Marble*; this Mass beat into Powder, and put it by degrees into *Linseed-Oil* (prepared before hand by boiling, or as followeth hereafter) put as much in, as the Oil will dissolve and then keep it for use.

N. B. First, This Varnish is of great use, for Varnishing of Sticks, Fans, Pots, Cups, Tables, Stones, Statues, Cabinets, &c. being laid on with a hard Pencil, the better to spread it over &c.

Second, To prepare the Oil of *Linseed*, or other the like Oil, for this Varnish.

Take *Linseed-Oil*, Q. L. and put into it a piece of Bread and presently there will be an Effervescence or Fermentation, made by means of the aqueous Particles; afterwards put in some Alkali, as *Lime*, *Chalk*, *Whiting*, and several Ca'ces of *Lead*, that the Acid may be absorbed; this done, let it settle, decant the clear, and clarify it, and so it is prepared for the aforesaid use, Take of this prepared Oil, and put it over

the Fire, and put in *per vices*, the aforesaid Powder of Amber : By managing of Sandrick thus, as you did the Amber, you make Sandrick-Varnish also. *Poligr.*

19. Of making a Varnish to preserve Timber or Wooden-work from Rotting.

Take the best and hardest *Rosin*, purify it well, and add to it a sufficient quantity of *Linseed-Oil*, viz. so much as may conveniently serve to toughen it; melt and incorporate them well on the Fire; then take *Umber*, ground very fine, and mix it therewith; which being well mixed together, and whilst it is hot, you may Varnish Timber, or any Wooden Work with it, at your Pleasure. — Where Note,

First, 'Tis observed, by Experiment, That this is an Excellent Varnish to preserve Timber or Wooden-work, and it lies like China-Varnish, and will endure Twenty times as long as any Painting, if well done.

Second, It is observed, to be a good Varnish to preserve Border-Boards in Gardens, or any other thing which you would have last long, in wet and moisture; as the Pillars of Horizontal Sur-Dials, Pails, Rails, Arbour-Benches, &c.

Thirdly, It's observed, That being spread on Cloth with a Trowel: it will make a most Excellent Covering for Tents, Huts, Houses of Pleasure, Turrets, Pens-Houses, &c.

Fourthly, That 'tis observ'd to be an Excellent thing to prime Hogsheds and Barrels, which are used to keep Water in; you may do them both, within and without, with it; by this means, they will last a long time.

Fifthly, Tho' burnt Umber be the best Colour to mix with it; yet you may mix other Colours with it in the same manner; as Verdegriase, Red-Lead, &c. but the two last Colours, some object against, by reason of their corroding quality.

Sixthly, And d. q. The best way to lay this Varnish on, is to heat it hot before you Varnish it, for then it will stick the closer and firmer to the Wood.

20. Of making an Impenetrable Varnish against the Water.

This Varnish is almost the same with the former, only *Mons. Lemery* gives a little different Directions for the making of it. Take, saith he, *Linseed-Oil*, and put it into an Earthen Pot, well glazed, and set it upon a hot Fire; add to it, about half a quarter of *Rosin*, which decoct together very gently, least it run over; at first it will smoake and bubble, but in continuing the decoction, 'twill all fall; continue the Ebullition, till it be so thick, as to rope, or thread like Varnish; when you have taken it off, if it be too thin, add more *Rosin*: Thus far of making it: now of its use. Where observe:

First, That with this *Varnish*, you may Varnish Artificial Fish (such as are directed to be made *Exper.*) or any thing else that you would have endure the *Water*; this *Varnish* must be dried in the *Sun*.

Secondly, This *Varnish* is observed to be of such strength, when thoroughly dry, that neither cold nor hot *Water* can hurt it.

Thirdly, Besure to take care, that the *Resin* be very clean, and that the Ebullition be continued long enough. *Lemer. Mod. Curis.*

21. Of making another Varnish that will Endure the Water.

Take *Linseed-Oil*, and decoct it over a gentle *Fire*; put into it some fine *Mastick*, till it be as thick when it is dissolved, as *Liquid Varnish*; with this, you may also mix Colours, which will make them very durable. *Ibid.*

22. Of making a very Bright and Shining Varnish, fit for Picture-Frames, Leather, or what else you think fit.

Take *Amber*, a quarter of an *Ounce*; *Gum-Lac*, Two *Drams*; *Oil of Botin*, Two *Drams*; *Botin*, One *Dram*; *Lytharge* and *Linseed Oil*, quantum satis.

The way of making of this Composition, is this: Take a *Pot* or *Glass*, into which, put a quantity of *Linseed Oil*, which decoct over a *Fire*, till it will burn a *Feaker*, being put into it, and then it is enough; then melt the *Amber* in a clean *Earthen Pipkin*, and put it into the *Linseed-Oil*; the *Gum-Lack* must be melted by it self, in the *Botin*; which pour into the same *Pot*, the *Gum-Lack* will melt, if you lightly anoint the same with *Linseed-Oil*; then strain all thro' a *Cloth*. If you would use any of this *Varnish* on *Silver* or *Gold*; take the finest *Yellow Earth*, well Washed from *Gravel* and *Filth*; and being well dried add a little *Minium* and *Ceruse*, with an equal quantity of *Oil of Nuts*, and *Spike-Oil*; boil them well, and with this Composition, design what you will; when 'tis cold, and with what Colours you please, mixt with *Gluten-Water*. After all, repeat the *Varnish*, and 'twill be as bright as a *Looking-Glass* *Ibid.*

23. Of making an Excellent Transparent Varnish, to lay upon any White Thing, to make it seem like Marble.

Take the clearest *Botin*, put it in a glazed *Earthen-Pot*, and boil it, till it hath quite done smoaking; then put in half an *Ounce* of *Sandricks*, as much *Mastick*, well contus'd; mix them till they are all well incorporated; then take off the *Pot*, adding half a *Pint* (or more, as you see cause) of *Oil of Bo*
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tin, upon a slow Fire, for a quarter of an Hour ; this keep for use ; if it be too thick, it is but adding more *Botin* to it. *Ibid.*

24. Of making a Varnish of a Gold Colour.

Take *Sandricks*, Two Ounces ; *Lytharge of Gold*, One Ounce ; the clearest *Linseed-Oil*, Four Ounces ; boil them well in a glazed *Earthen Pot*. *Ibid.*

25. Of making a Varnish for Images.

Take *Oil of Botin*, and *Botin* mingled together, stir them with your Finger till they become of a convenient thickness to Work withal. *Ibid.*

26. Of making a Varnish, to lay on Figures of Medals of Plaister.

Take *Soap of Alicant*, which is *White* ; scrape it in thin Pieces, and put it in a glazed *Pot* with some *Water*, and with your Finger, temper it by little and little, till it be all *Liquified*, about the consistence of thick *Milk* ; let it settle about a Week or more, covering it from Dust ; then with a soft short *Brush*, Wash the *Plaister*, setting it at some distance from the *Fire*, to dry by degrees ; being dry, rub it gently with a *Cloth*, setting it in a good Light, the better to discern where to *Polish* it ; thus will your *Plaister* become as bright as *Alabaster*. *Ibid.*

27. Of making an Excellent Varnish to preserve Timber, Cloth and Leather ; so as they may be applied to Various Uses.

This *Experiment* is no other, than the discovery of a Way and Mystery of making *Oil-Cloth*, now much in use for *Hat-Cases*, and that is this : Take of the drying *Oil*, that is mentioned, *Observ. 45. Numb. 5.* set it on the *Fire*, and dissolve in it, some good *Rosin* or (which is better, but dearer) *Gum-Lack* ; let the quantity be such, as may make the *Oil* as thick as *Balsom*, for it must not be so thin as to run about ; if spread on a *Cloth* or the like, when the *Rosin* or *Gums* are dissolved, you may either Work it off it self, or add to it some Colour ; as *Verdigrease* for a *Green*, *Umber* for a *Hair Colour*, *White-Lead* and *Lampblack* for a *Grey* ; *Indico* for a *Blue*. Thus far of its Composition. We will now proceed to the *Observations* which have been made on it. And,

First, It is observed, That this *Varnish*, if it be spread on *Canvas*, or any other *Linnea-Cloth*, so that the *Cloth* be fully drenched, and entirely glazed over with it, and suffer'd thoroughly to dry, is impenetrable for all manner of wet ; and if *Carriers* and *Haglers*, and such kind of Persons, as are forced to Travel in all manner of Weather, had but little light

Canvass Cloaks made for them ; and these *Cloaks* were afterwards Varnish'd over with this *Varnish*, they would secure them from wet, as well as if they remained in their own Houses ; for as I said before, no Wet will penetrate thro it, 'Twenty Four Hours Rain will make no more impression on it, than if it had never Rained at all.

Secondly, The Officers *Tents* in an Army or Camp, if Plaister'd over with this *Varnish*, will preserve them as securely from all wet, as the best Houses, and be as warm and dry ; neither will there follow a great inconveniency in decamping ; for *Canvass* so Varnish'd, is almost as plyable as the naked *Cloth*, and not very much heavier, especially if the *Varnish* be laid on without any Colour in it, for then it will be lighter and more plyable.

Thirdly, The same advantage may *Seamen* reap by it, or any other Persons that must attend in Storms and Rain ; as *Shepherds Neatbeards*, &c.

Fourthly, *Sheep-Skin-Boots* well Liquored with this *Varnish* after it is made ; and so thoroughly done over, as to lye with a gloss on the outside, shall endure more wet, than the best *Neats-Leather-Boots* that ever was made ; being also much more plyable, easy and light ; the same may be said of *Shoes*, in a great Measure.

Fifthly, The great reason why Oil'd *Hat Cases* have not been more in use, is by reason of the difficulty of forming it into Garments, and then the very *Hat-Cases* themselves do let water in at the Seams ; but this *Varnish* being laid on after the Garments are made, does so intirely secure every part, as there is no possibility or place, for the Wet's admittance.

Sixthly, The same may be of advantage, to abundance of other Humane necessities, too long here to enumerate ; and for securing any kind of *Timber-work* it equals Painting with Colours in *Oil*, and much more easy to attain ; for *Linseed-Oil* and *Resin*, are much more easily melted together by boiling, than Colours can any ways be Ground ; and being of the Consistence of *Balsom*, works delicately with a *Brush*, and of it self, without the addition of Colours, bears a Body sufficient to secure all manner of *Timber-work*, equal too, if not beyond *Oil Colours*.

Seventhly, In working of it, there is no great skill required, if you can but use a *Painters Brush* ; only let the Matter you lay it on, be thoroughly drenched, that the outside may be glazed with it ; twice doing, is sufficient ; but besure observe to let it be thoroughly dry before you use it.

Eighth, It is observed, That if you use *Gum-Lack*, it will dry soonest, which I have known it to do in a Weeks time.

Ninthly, If you desire a Colour on the outside, you need only grind Colour with the last *Varnish* you lay on. *Smi. Ar. Pan.*

28. *Of making a Varnish particular for Gold, Silver, Tin, or Copper.*

Take *Linseed-Oil*, Six Ounces, *Mastick*, *Aloes Epatick*, and One Ounce; put the Gums in Powder, into the Oil, into an Earthen Glazed Pot; which cover with another, luting them together; in the bottom of which, let there be a hole, into which, put a small Stick, with a broad end to stir it withal; cover them all over with Clay (except the hole) set it over the Fire, and stir it as often as it seetheth, for a little while, then strain it for use.

Before you lay on this Varnish, let the Metal be Polished, and then strike it over. *Poligraph.*

29. *Of making a Red Varnish.*

Take Spirit of Wine, a Quart; Gum-Lack Four Ounces; Sanguis-Draconis in fine Powder, Eight Ounces; Cochenele One Ounce; digest it a Week over a gentle heat, and then strain it for use. *Ibid.*

30. *Of making a Yellow Varnish.*

Take Spirit of Wine, a Pint, in which, infuse (Three or Four Days) Saffron half an Ounce; then strain it, and add Aloes Succotrina, One Ounce; Sanguis Draconis Two Ounces; which digest Six or Seven Days over a gentle heat close cover'd, then strain it for use. *Ibid.*

31. *Of making Common Varnish.*

Take Spirit of Wine a Quart, Rosin One Ounce, Gum-Lack Quantum satis; dissolve the Gums in a gentle heat (being close covered) and let them settle; then gently decant off the clear, which keep in a close Glass-Bottle for use.

The thick which remains, you may strain thro' a Cloth and keep for other purposes. *Ibid.*

32. *Of making another sort of Common Varnish.*

Take Oil of Turpentine and Oil of Spike, and Gum-Sandrack ana Partes Equales, mix them together, and let them stand over the Fire, till the Sandrack is dissolved, and it is done: If the Fire should chance to catch hold on it, clap a Pewter Dish, or cover the top of the Vessel close, and it will immediately go out. *Ibid.*

33. *Of making a Varnish for Painting in Oil.*

Take Mastick Two Ounces, Oil of Borin One Ounce; put the Mastick in Powder, in the Oil, and melt it over the Fire, letting it boil little or nothing (least it be clammy) when it is enough, you may know by putting a in Hens Feather, for then it will burn it. *Ibid.*

34. *Of making a Varnish for Painted Pictures.*

Take *White Rosin* a Pound, *Plum-Tree Gum* (or *Gum-Arabick*) *Venice-Botin*, *Linseed-Oil*, ana Two Ounces; first melt the *Rosin* and strain it very hot, steep the *Gum* in *Oil-Olive* (*Oil of Ben* is better) till it is dissolved; strain it, to which put the *Botin* and *Rosin*, and over a slow *Fire*, mingle them till they are well dissolved; when you use it, use it hot. *Ibid.*

35. *Of making another for the same use.*

Take *Olibanum* and *Gum-Sandruck* in Powder, which mingle with *Venice-Botin*, melting and incorporating them still over a gentle *Fire*, then strain it whilst it is hot.

When you use it, let it be hot. and your *Varnish* will shine well; it dries immediately. *Ibid.*

36. *Of making another Varnish for the same use.*

Take *Oil of Linseed*, which distill in a Glass Retort, One Ounce; Fair *Amber* dissolved, Three Ounces; mix them over a slow *Fire*, and it is done. *Ibid.*

37. *Of making a drying Varnish, to lay on Gold or Silver upon Wood.*

Take One Pound and half of *Oil of Spibe*; the best of *Mastick* and *Sandruck* ana Five Ounces; put it altogether in a Glass, and boil it in *Balneo*, putting a Cloth in the bottom; stir it often for three Hours, the longer the better; and after it is cool, let it stand in the Scum for Ten Days. *Sander. Graph.*

38. *Of making a good hard Varnish, to Varnish a Print with.*

Take Two Ounces of *Gum-Sandruck*, the whitest you can get, and half an Ounce of *Mastick*, and about a quarter of an Ounce of *Venice-Botin*; put these into a Glass, to a Pint of *Spirit of Wine*, which must be exquisitely dephlegm'd, and so stop it up and keep it in the Sun, till it is dissolved.

First, You must observe, before you *Varnish* your Picture, to steep some *Gum Dragon* in fair *Water*; with which, you must, with a fine *Hair Pencil*, Wash over your Picture.

Secondly, When this *Varnish* is dry, you may Prescle it and Burnish it, according to some of the former Experiments. *Alb. Dur. Revi.*

39. *Of making another Varnish fit to lay on Old Painting, or Pictures, when new Cleansed.*

Take an Ounce of clear *Venice-Botin*, with an Ounce and half of *Spirit of Botin*, and Three or Four Ounces of drying *Varnish*; mix all in a Glass-Vial, and dissolve it in *Balneo Maria*; when it's cold, stroke it over the Picture with a *Pencil*. *Lemer. Mod. Curi.*

40. *Of making another, which may serve for the same Use.*

Take the glair of *Eggs*, beat them up to a Spume, with a *Fig-tree-Twig*; with the Limpid part of it, Wash over the Picture. *Ibid.*

41. *Of making common Lacker-Varnish.*

Take a Quart of *Spirit of Wine*, put it into a *Pottle-Bottle*; of *Shell-Lack* Eight Ounces, beaten small enough to enter the *Bottle*, shake them well together; having stood till they are quite dissolved; strain it and reduce to powder a small quantity of *Sanguis-Draconis*; which, with a little *Turmeric* tied up in a *Rag*, put into it, let it stand a Day, and at your leisure Hours, shake it: You may alter the Colour, heighten or abate it, by adding or diminishing the quantity of the two latter Ingredients. *Stat. Treat. Fap.*

42. *Of making another sort of Lacker.*

Take the same quantity of *Spirit of Wine*, and *Shell-Lack* as before when it is dissolved, strain it, but to give it a Tincture; instead of common *Dragons Blood* and *Turmeric*; employ a very little *Sanguis-Draconis* in Drops, and *Saffron* dried; which bruise, and put into a piece of *Linnen*, and manage it as the other, putting it into the Vessel. If you desire the *Lacker* of a deeper or more Copper Colour, add more *Sanguis*; if the contrary, *Saffron*. These being well shak'd, keep close stop'd for your Designs. *Ibid.*

43. *Of making the best sort of Lacker now used among Gilders.*

Some use *Shell-Lack-Varnish* only for this *Lacker*, but *Seed-Lack* is much better. Take therefore, a quantity of *Seed-Lack-Varnish* answerable to the *Lacker* you have occasion for; to which, give a Tincture after this manner. Take *Ornator* very finely Pulveriz'd, mix it, and some of the *Varnish* in a *Gallipot*; stir, and dissolve it over a gentle *Fire*; after this, put it into a *Vial* closely stop'd. Take likewise, Three or Four Ounces of *Gambogium*, which must be bruised, and dissolved on the *Fire*, and kept in a *Vial* as the other: To a Quart of this *Varnish*, if you please, you may put two penny worth of *Saffron* dried and bruised; to these, Five or Six Spoonfuls of the *Ornator*, and a double Portion of *Gambogium-Varnish*; being

being shaken well together, try it on a little bit of *Silver-Foil*, or a small *Frame*; if it appears too *Yellow*, add more *Ornator*, if too *Red*, more *Gambogium*; by this method, you may attain to the true *Silver Colour*. *Ibid.*

44. *Of making another Lacker, that may be used without Fire or Sun.*

To a Quart of the aforesaid *Lacker*, allow two Pound of *Venice-Resin*, mix and incorporate them very well, with this, you may *Lacker* any thing in the open Air, altho it may look dull and misty immediately after every *Lackering*; in a little time, that cloudiness will pass away, and it will attain a piercing *Luster*. *Ibid.*

Having proceed thus far, and laid before you Forty Four Experiments of making *Varnishes*, we will add a few more of using them, and *Lackers*: And our next Number shall be

45. *Of the Method of Lackering Oil, Size, or Burnish'd Silver.*

Let your *Frame* or *Work* be *Tepid* before you *Lacker* it, and when some of your *Lacker* is poured into a large *Gallipot*, with a Fine large *Brush*, that does not drop any of its *Hairs*, made of *Hogs* or *Camels Hair*; be quick and pass over the Piece, carefully contriving to miss no part, or to re-pass another that hath been already *Lacker'd*: In *Lackering* Carved Work, you must be quick, and strike, or jobb your *Brush*; thereby to cover the deep parts also; be sure to lay it thin and even, and presently make it *Tepid* by the *Fire*, whilst it looks bright; for by these means, you may *Lacker* it again, in a quarter of an Hour, making it *Tepid*, before and after the Operation. If two or three *Varnishings* will not produce a Colour deep enough, oblige it with a fourth; but be sure not to make it too deep, for then it will be past Cure. *Ibid.*

46. *Of making Lacker'd Work shew like Burnish'd Gold.*

If you are careful and neat in *Burnishing* your *Silver*, and have graced your *Lacker* with a true *Golden Colour*, and have with an even Hand laid it on no thicker at one place than another; then *Matt* and *Repos* it, as you do *Burnish'd Gold*, and unless it be narrowly surveyed, 'twill put a fallacy upon, and deceive curious Eyes. *Matt*ing is only the Ground Work of your Carving, alter'd or *Varnish'd* deeper, and more dull than the other part of the *Frame*. *Repos*ing is done with a *Lacker*, and *Ornator* (which latter, the *Druggsters* sell

sell at Four Pence per Ounce) with these, mix, touch and deepen all the hollow Places and Veins of your Work, for it adorns and sets it off admirably. *Ibid.*

47. Of general Rules to be observed in all manner of Varnishing.

First, If it be *Wood* which you intend to *Varnish*, let it be close grain'd, exempt from *Knots* and *Greasiness*; very Polite and clean, and well *Prescil'd*.

Secondly, If you use *Colours*. lay them exquisitely even and smooth, and when any *Asperities* in your *Colour* or *Varnish* appear, *Prescile* them off.

Thirdly, Keep your Work always Tepid, and by no means torrid, which will certainly blister or crack it; if such a mischance should happen, 'tis next to irreparable, and the *Varnish* must be all scraped off.

Fourthly, Let your Work be thoroughly dry'd after every *Lotion*, for else it will be rough and knotty.

Fifthly, Let your Work lye by, and rest, as long as your conveniency will admit, after it is *Varnished*; for the longer it stands the better.

Sixthly, Observe to begin your *Varnishing* stroak in the middle of the *Table* or *Box*, and not in the full length, from end to end; so that your *Brush* being planted in the middle of your Work, strike it to one Extream; and then taking it off, fix it to the mean again, and extend it to the other Extream and so continue till the whole *Area* be *Varnish'd* over; for should you Operate otherwise, you would be in danger, of overlaying the Edges or Margin of your Work; when you take *Varnish* with your *Tool* out of your *Gallipot*, stroke it once or twice against the Rim, to prevent a superfluity of your *Varnish* in your *Tool*.

Seventhly, When you come to *Burnishing*, let your *Tripole* be very finely *Pulverized*, by *Razing* it with a *Knife* or *Glass*; for Fine Work, your Rags must be Fine, and so must your *Tripole*; for common Work, both sorts may be courser; let your Hand be moderately hard but very even, in all your Polishing Stroaks; and observe to make one place as Polite as you intend it to be made at that time, before you forsake it, and pass over to another.

Eighthly, Observe, never to *Polish* your Work as Polite as you intend it, at one time, but let it rest Three or Four Days, if you can, after the first *Burnishing*, and then give it the finishing stroak. Be observing likewise, that you come not near the *Wood*; if you should, it will demand another *Varnishing*.

Ninthly, Observe to take a large quantity of *Tripoly* at first, till it begins to be terse, afterwards a small parcel will suffice. Observe to examine circumspectly, your *Tripoly* and
Clout,

Clout, and see that it be free from *Gravel* and *Grittiness*; if it should so happen that it should be gravelly, and raze it, you must wrap your *Cloth* about your *Index*. and *Polish* the faulty place, till you have brought it to a good liking.

Tenthly, When you resolve to clear up your Work, Wash off the *Tripoly* with a *Sponge* and *Water*, absorb the *Water* with dry *Linnen*, and with *Oil*, blended with *Lampblack*. anoint the whole surface of your Work; let no Corner or Moulding escape; this will totally free it from the *Tripoly*. You must next with a clean *Rag*, take off the *Oyl*; and then, with another very fine, soft and arid, rub it all over, spare no place nor Pains, but salute it with agile quick stroaks, and as hard a Hand, and it will procure an incomparable Gloss.

Eleventhly, And lastly, *Observe* in *Burnishing white* Work, that your Hand be even and light, and your Skill in *Polishing* Neat and Curious; and when it is clear'd up, you must use fine *Flower* and *Oil*. Ibid.

48. Of Varnishing Olive Wood.

That *Olive* Work which is cleanly wrought off, void of Cracks, Flaws, &c. is a fit Subject for this purpose. Having Prescl'd it over diligently, set it by a weak *Fire*, or some place where it may be Tepid; and whilst it is in this condition, Wash it over Ten or Twelve times, with *Seed-Lack-Varnish* that remained after you had pour'd off the top for a better use; with a Tool proportionable to your Work, let it be thoroughly arid between every lotion; and if there arise any roughness, Prescle it off as fast as you meet with it: After this, Prescle it till it is sleek; and when it is very arid, anoint Six times with the top or finest part of your *Seed Lack-Varnish*: After Three Days standing, you may proceed to *Polishing*, with finely Pulveriz'd *Tripoly*, and a Cloth dip'd in *Water*, fricate it till it be polite; but be careful of using too much friction, for fear of fretting off too much of your *Varnish*, which cannot be easily repair'd. If when you have labour'd some time, you use your *Rag* often wet in *Water* with *Tripoly*, you will obtain the better Gloss. Then wipe off your *Tripoly* with a *Sponge* full of *Water*, and the *Water* with an arid *Rag*; then do it over with *Lampblack* and *Oil*, cleanse off that with a *Cloth*, and clarify it up with another. If after all your pains, your Work look dull and misty, which *Polishing* before it is arid (and damp Weather) will effect, give it a slight *Burnish* and *Clarify* it up, and 'twill restore its Pristine Beauty. If you have been too niggardly of your *Varnish*, and there is not enough to bear a *Polish*, afford it Four or Five lotions more of your *Seed-Lack-Varnish*, and after two Days, clear it up. If you have a desire to keep the *Genuine* Colour of the *Wood*, then employ the *White-Varnish*; for the *Seed-Lack* being of a Redish Tawny Colour,

Colour, and too often Washed with it, must of necessity, heighten and increase the natural one of the *Olive*. Ibid.

49. Of Varnishing Walnut-Wood.

To avoid *Tautology*, I shall refer you to the last *Num.* and desire you to observe the same method exactly, for *Varnishing Walnut*; that is there directed for *Olive*. And farther observe, That those Rules will hold good also, for all sorts of *Wood*, that are of a close smooth Grain, such as *Tew*, *Box*, *Lime-Tree*, *Pear-Tree*, &c. Ibid.

50. Of Varnishing Prints with White Varnish.

First, Get a *Board* very fit and exact to the *Print* you design for to *Varnish*, and thus manage it; get common *Size*, make it Tepid by the *Fire*, razing *Whiting* into it; make it of an indifferent thickness, and with a soft *Hogs-Hair-Brush*, proportionable to your *Board*, Wash it once over, and let it be arid; then white it again, and thus reiterate till it bears a good Body, and quite covers the Grain of the *Wood*, which may be *Deal*, *Oak*, or any other. This done, Prescle it close and smooth, but not so far to discover the Grain: Then with *Flower* and *Water*, make a *Paste* as thick as *Starch*, and with your *Hand* or *Brush*, Work over the backside of your *Print*, and with an even steady Hand, lay your *Print* on the *Board*, and stick it on as close as you can; suffer it not to Wrinkle, nor rise in little Bladders; if it shou'd, press them down with your Hand; but besure your Hands be mundified: Smooth down the whole Paper with your Hands, that every part may adhere to the *Whiting*. Being thus closely fix'd to the *Board*, set it by for Twenty Four Hours, or longer; then take well mundified *Ichthyocolle Size*, and with a soft *Pencil*, allow your *Print*, one *Lotion*; but be sure it be arid, before you pass it over again, which you must do with a quick Hand, and not twice in a place; give it time to dry, and afford one *Lotion* more, with two Days rest: Afterwards, with the finest and clearest of your *White Varnish*, afford it Six *Lotions*, by a gentle tepor, not too nigh the *Fire*, to avoid *Blistering*. When Twenty Four Hours are past, give it Eight *Lotions*, with the said Transparent *Varnish*; lay it by for two Days, and then vouchsafe to anoint Six or Seven times more, giving it time to rest two or three, Days. Having proceeded thus far, with *Linnen* and *Tripoly* both very fine; *Burnish* it but with gentle and easy stroaks: And lastly, clear it up with *Oil* and *Flower*. Ibid.

51. Of preparing ordinary Rough Grained Woods, as Deal, Oak, &c. whereby they may be Varnished or Japan'd.

Provide ordinary *Size*, used by *Plasterers*, dissolve it over the *Fire*, making it pretty Tepid, mix *Whiting* with it, till it
is

is of a reasonable consistence, but not too thick; then take a Tool fit for the purpose, made of *Hogs-Hair*; lay your Work once over with this mixture; repeat so often, till you have hid all the Pores and Grain of the *Wood*, suffering it to be thoroughly arid, between every turn. Afterwards, take a fine humid *Rag*, and Furbush over your Work, and make it as slick as you can; this Action we call *Water-Planing*; when dry, Prescle it as smooth as you can, and as near the Grain. This done, give your Work two *Lotions* with the thickest of your *Seed-Lack-Varnish*; after which, if it be not smooth, Prescle it again, and in a day or so, *Varnish* it over with *Black* or any other Colour; when it hath stood a sufficient time, you may proceed to *Polish* it.

According to these Methods, you are to prime *Carved-Frames* for *Cabinets* or *Chairs*, when you desire they should look well; with this difference, that these must not be *Polished*; and by consequence, require not so big a Body of *Varnish*, no more than will contribute to a splendid Gloss. There is another way which I commend for the most valuable, because most durable; but not of so large an extent as the former, being proper only for the tops of *Tables* and *Boxes*, or the like; and thus you must proceed. Boil common *Gluten* in *Water*, let it be fine, and of a good tenuity; into which, cast the finest *Saw Dust* (*Joiners Putty* is better) until it is indifferently incrassated, and fit to lay with a *Brush*: Run it once over with this *Gluten* so incorporated, if the Grain of the *Wood* be not obscured, give it another *Lotion*; and two Days being allow'd to indurate it, send it to a good Workman, or *Cabinet maker*, who must scrape it with his *Scraper*, as *Pear-Tree*, or *Olive-Wood* are served; and make it as fine and even as you can; then *Varnish* it, as you do *Pear-Tree*, or other *Wood*: This, if well done, will not come behind any, for Beauty, or Durability. 'Tis confess'd, these Labours are to be performed, but upon Cases of necessity, for they are very troublesome, and not so cheap or valuable, as your smooth close grain'd *Woods*; of which, *Pear Tree* is in the first place to be esteemed. *Ibid.*

52. Of dephlegming Brandy, thereby adapting it to make Varnish with.

This Experiment I have added, to gratify such Curious Genius's, as would willingly put in practice some of the former Experiments, of making *Varnish*, and cannot tell how to procure *Spirit of Wine*; but they may easily be furnished with *Brandy* in any Country Town or Village; and how to adapt, that to make it fit to dissolve the *Gums*, you shall have it in the Language, and according to the Honorable and Ingenious Esq; *Bott's* own Experiment. I have sometimes (saith he) taken Pleasure to dephlegm *Brandy* (as they call weak *Spirit of Vin.*, of the first distillation) by only putting it into

Salt

Parag. I. in AGRICULTURE, &c. I

Salt of Tartar. For considering the Faculty this *Alcalizate* Body has, to attract the *aqueous* Particles that Swim in the Air, and resolve it self in that *Liquid*, which *Chymists* call *Oil of Tartar, Perdeliquium*: there seem'd sufficient reason, to expect, That the same *Salt* being put very arid into *Phlegmatick Spirit of Wine*, would embody with the *Phlegmatick* Parts; with which, if it were not overcharged, it would probably keep them separate from the more spirituous *Liquid*, since such *Oil of Tartar*, as I just now mentioned, and dephlegm'd *Spirit of Wine*, will float upon another without mixing; and accordingly, I have sometimes taken pleasure, by putting a sufficient proportion of arid *Salt of Tartar*, into *Brandy*, and leaving it there, for some time (for the *Experiment* will, to be Completed, require some while) to make some separation of a great part of the *Phlegm*; which by degrees, dissolving the *Salt*, will reduce again part of it into a *Liquor*, that will keep its surface distinct from that of its supernatant S. and if confounded by shaking the *Glass*, would speedily part from it, and regain its own Station; and if you would have a separation of the *Phlegm* to appear speedily, you may effect what you intend, by tying up a convenient quantity of arid *Salt of Tartar*, in a dry Rag of *Linnen*, and immersing it a little while in *Brandy*, and then lifting it up above the *Liquor*, will in drops (whose descent will be distinguishable enough, if the *Glass* be held against the Light) fall to the bottom of the *Spirit of Wine*, and less you shou'd suspect, this descent comes not from the weight of the *Liquor*, but from the force they acquire in their falling thro' the Air; you may keep the Rag immersed beneath the surface of the *Liquor*; and yet you may perceive the Efflux and Subsistence of the *Lixivium* we have been speaking of. *Boils.*
use Nat. Exper. Philos.

I did intend to have next presented the Reader with some *Experiments* and *Observations*, on *Fineering of Wood, Polishing it, Glewing it, &c.*

But finding I shall exceed my intended bounds, I must reserve it for another *Volume*; as I must also, what I here intend to have added, concerning such *Observations* and *Experiments*, as relate to *Gilding, Colouring, Burnishing or Polishing, Refining, Separating, Soldering, Tempering* (making them either soft or hard) *preserving from Rust, &c. Metals*; so that I must omit (to comply with the Bookseller, who is unwilling the first *Volume* should be too large) Four or Five *Paragraphs*: For all which *Parag.* I had Collected many *Curiosities* in the *Mechanicks*, not commonly known in the World; as the *Statuaries* Art; whereby you may represent any Animal, or Vegetable, either in *Metal* or *Plaster*, and that to the Life, either Naked or Clothed; as suppose a Man with all his Features, or any other Creature: And as to Vegetables, to make the perfect form of any *Leaf, Flower, or Fruit*; and that too, according to

both *English* and *French* Artists *Observations*; as also *Observations* on the Art of *VVax-work*, whereby you may represent, not only the Colour, but the shape too, of any *Fruit*, &c. and that it shall seem natural; and many other things of the like nature. And likewise the *Potters* Art, in imitating *China-ware*; also many curious *Experiments*, relating to *Glass-work*, as *Painting* it, *Foliating*, or *Silvering* *Looking-Glasses*, either *Plain*, *Concave*, or *Hallow*; and also of *Grinding* and *Polishing* them, and *Metaline* ones, of any *Figure*.

And many Curious *Experiments* in *Enameling*, and likewise in *Painting*; as taking *Draughts* of *Pictures* or *Printed* *Cuts*, *Shapes* of *Green Leaves*, &c. *Extracting* of *Tinctures*, or *Lakes* of *Flowers*, *Herbs*, *Berries* and *Wood*; making of many Curious Colours; as *Ultramarine*, and many more of great use in *Painting*: As also various *Experiments* on making *Weather-wisfers*; as *Barometors* or *Weather-Glasses*. *Thermometers*, *Hygrocopes*, &c. also on *Miscroscopes*, &c. and on making *Globes*, *Maps*, &c.

And likewise, many *Experiments* on making *Paper* to serve many uses; also *Horn*, *Clements*, *Inks*, &c. *Cloths*, *Linnen* and *Woollen*, *Silk*, &c.

And likewise, many *Experiments* and *Observations* preparing, &c. of our *English Minerals*; as *Silver*, *Tin*, *Iron*, *Vitriol*, *Red Lead*, *Allom*, *Salt*, &c.

Also on making *Pitch*, *Tar*, *Char-Coal*, &c. Also *Colouring* or *Dying* of *Leather*, *Bristles*, *Feathers*, &c.

And likewise, many Curious *Experiments* and *Observations* on *Drawing*, *Engraving* to the *Life*, *Etching*, &c.

C H A P. II.

Experiments and Observations

I N

Husbandry, Gardening, &c.

P R O E M.

T*erraculture* [or the Tillage of the Earth] is the most *Ancient*, most *Noble*, and most *Useful*, of all *Practical Sciences*.

As for its *Antiquity*, it is almost *coævous* with the World it self, for we find it practis'd by *Adam*, Gen. 2. 15, and 3. 23; and by his Sons; Gen. 4. 3. and afterwards by several of the *Patriarchs*, and particularly by *Noah*; Gen. 9. 20.

As for the Nobility of this *Science*, (tho' it be by many, accounted a base and mean Study; yet I say) besides that *Adam*, and several of the *Patriarch's*, scorn'd not the Study and Practice of it. It was so highly esteem'd by the *Ancients*, that many *Poets*, *Philosophers*, *Princes*, and *Kings* themselves, did not only acquire an honourable and immortal Name, by their Writings and Precepts in it, which they left to Posterity; but many of them, have diligently perform'd the Office of a Country-man, working with their own Hands, and thereby obtain'd no small Fame and Renown. I shall instance only in *Cyrus*, the Renowned King of *Persia*; of whom *Socrates* relates, That he had a Garden, inclosed with a Noble Fence, most curiously Cultivated, and Artificially Planted, with various sorts of *Trees*, set in the Quincial order, and adorned with variety of *Flowers*, &c. and all this, done by the Labour of his own Hands, as well as the skill of his own Head. I shall add, That the *Holy-Ghost* himself, has been pleas'd to Honour this Science; not only in appointing *Adam* the Practice of it, even when he was in *Paradise*, Gen. 2. 15. But also in the History of the First *Monarchs* of the World, from *Adam* to *Noah*; there is nothing of their Actions mention'd, but only That they lived so long, and taught their Posterity Husbandry, &c.

As to the Utility of *Terraculture*, it must be acknowledged by all, to be the most useful of all *Humane Sciences*; and that, without which (since the unhappy *Fall* of our First *Parents*, and the *Curse* upon the Earth, consequent thereupon) none in *City* or *Country* could subsist, unless they would be content to live like *Brutes*. But I shall forbear to enlarge upon these *Theams*, lest I should seem to stray too much from my Subject in Hand; but chiefly, because they have been copiously handl'd already, by many good Authors; particularly

ticularly by the Ingenious Mr. Worlidge, in his *Systema Agriculturae*.

But now to come nearer to the Matter in hand, I shall conclude this Proematal Discourse, by informing the Reader, That by Terræcultural EXPERIMENTS and OBSERVATIONS; I would be understood to mean, such as relate to the Vegetation of Vegetables.

PARAGRAPH. I.

Of the Vegetation and Structure of *Plants*, from the Seed Sown, to the formation of the *Root, Trunk, Branch, Leaf, Flower, Fruit*; and lastly, of the Seed to be Sown again.

The Learned and Ingenious Mr. Grew, has observ'd, in his Anatomy of Vegetables.

First, That the Method which Nature follows in her continu'd Series of Vegetation, is thus; from the Seed Sown, she proceeds to the Formation of the *Root, Trunk, Branch, Leaf, Flower, Fruit*; and last of all, of the Seed, to be Sown again.

Secondly, That the Essential Constitutions of the said Parts, are in all Vegetables the same, tho' more easily discern'd in some, than in others.

Thirdly, That all Seeds (even the smallest) are divided into just two *Halves* or *Lobes* (excepting a very few Seeds, which are not divided into two *Lobes*, but more; as that of *Cresses*, into five, and some not at all divided, as *Corn*) as is visible in a green *Bean*; especially if Young or Boil'd, and the Coat stripp'd off.

Fourthly, That all Seeds have Three Constituent or Organical Parts, viz. First, The *Main Body* of the Seed (wrap'd in its several Coats, and for the most part) divided into two *Lumps* or *Lobes*. Secondly, The *Radicule*; and Thirdly, The *Plume*; and these are essential to all Seed, and are plainly discernable in the Garden *Bean*.

Fifthly, That all Seeds have also Three Similar Parts, viz. First, the *Cuticle*; Secondly, The *Parenchyma*, and Thirdly, The *Seminal-Roots*.

Sixthly, That the outer Coats of all Seeds, are perforated with a small *Foramen* or *Hole*.

Seventhly, That all those things mention'd in *Observ.* the 3d, 4th, 5th and 6th, may be seen in a Garden *Bean* (especially when Green) even (without Glasses) by the bare Eye. For, First, on one side near the Basis [*i. e.* the thicker End, where the *Peduncle* (commonly call'd the Eye) grows] of the *Bean*, is a small *Foramen* or *Hole* (yet big enough to admit a small *Virginal Wire*) which passes through the outer Coat, and terminates against the Point of the *Radicule*. Secondly, The outer Coat being taken off, the *Radicule* shews it self (like a small *Germen* or *Bud*, coming out from between the two *Lobes* of the *Bean*) it is of a whiter Colour, and more glossy than the main Body; especially when the *Bean*

is Young : In the *Bean*, and many other *Seeds*, 'tis situated somewhat above the thicker end, as you hold the *Bean* in his most proper Posture for growth. In *Oak-Kernels* (which we call *Acorns*) *Apple-Kernels*, *Almonds*, and many other *Seeds* ; it stands prominent just from the End, the *Basis* and the End, being in these the same, but in the *Bean*, divers. This part is not only in the *Bean*, and the *Seeds* above named, but in all others ; being that, which upon the Vegetation of the *Seed*, becomes the Root of the Plant ; and is therefore call'd the *Radicle*. Thirdly, The *Main Body* of the *Seed*, as was before hinted) is divided Length-wise, into two *Halves* or *Lobes*, which are joyn'd together at the *Basis* of the *Bean*. Fourthly, The *Plume* lies enclos'd in two small Cavities, form'd in the *Lobes* for its Reception ; and upon separating, the *Lobes* is plainly apparent, being of Colour near like that of the *Radicle*, and founded on the *Basis* thereof (but having a quite contrary Production, viz towards the Cone of the *Bean*) it being that part, which in process, becomes the *Body* or *Trunk* of the Vegetable. This Part is not like the *Radicle*, an intire Body ; but divided it at its loose End, in divers Pieces, all very close set together, as *Feathers* in a *Bunch*, whence it is call'd the *Plume* : They are so close, that only two or three of the utmost are at first seen ; but upon a nice and curious separation of these ; the more interior still may be discover'd. Now, as the *Plume* is that part which becomes the *Trunk* of the Plant ; so these pieces are so many true, and already form'd (tho not display'd) *Leaves*, intended for the said *Trunk*, and folded up in the same Plicature ; wherein, upon the sprouting of the *Bean*, they afterwards appear. Fifthly, As the *Organical*, so also the *Similar parts* may be plainly seen in a *Bean* : For in dissecting a *Bean* after having taken off the *Tunicle* or *Coat* (vulgarly call'd the *Shuck*) the first thing that appears, is its *Cuticle*. The Eye and first Thoughts, suggest it to be only a more dense and Glossy Superficies ; but better inquiry, discovers it to be a real *Cuticle* : 'Tis so exquisitely thin, and for the most part, so firmly continuous with the *Body* of the *Bean*, that it cannot, except in some small *Rag*, be distinctly seen ; which by carrying your *Knife* superficially into the *Bean*, and then very gently bearing upward what you have cut, will separate, and shew it self transparent. This *Cuticle*, is not only spread upon the *Convex* of the *Lobes*, but also on their *Flats* where they are contiguous, extending it self likewise, upon both the *Radicle* and the *Plume*, and so over the whole *Bean*. This part is different from the *Coats* ; for, whereas these upon setting the *Bean*, do only administer the *Sap*, and then *Dye* : The *Cuticle* (with the *Organical Parts*) is nourished, augmented, and by a real Vegetation co-extended. Sixthly, The *Cuticle* being taken off, the next thing to be seen is, the *Parenchyma* ; the *Main Body* of the *Seed* seems to vulgar Eyes, to be nothing else ;

else ; being view'd through a *Microscope*, it has some similitude to the Pith, while sappy, in the *Roots* and *Trunks* of *Plants*. It is common to (and the same in) the *Lobes*, *Radicle* and *Plume*, but in differing Proportions ; for it makes but about three Fifths of the whole *Plume*, and about five Sevenths of the whole *Radicle* ; but in each *Lobe*, is so far over Proportionate, as to make at least, nine Tenths of the whole *Lobe*. Seventhly, The *Seminal-Root* lies Embosom'd in the *Parenchyma*, and may be found, not only in the *Radicle* and the *Plume*, but also in the *Lobes* themselves. This *Seminal-Root*, may best be seen in the *Radicle*, by cutting it athwart, and so proceeding by degrees, through the *Plume*, through both which, it runs in a large and straight *Trunk* ; but in the *Lobes*, it is in so small Proportion, that it is very difficultly seen (especially towards their *Verges*) yet, if with a sharp *Knife*, you smoothly cut the *Lobes* of the *Bean* athwart, divers small Specks (of a different Colour from the *Parenchyma*) may be seen, standing along in a Line ; which Specks, are the Terminations of the Branches of the *Seminal-Root*, so cut off ; and as this *Seminal-Root* is existent in every *Orangical part* of the *Bean*, so is it, with respect to each Part, most regularly distributed ; for in a good part of the *Radicle* 'tis one intire *Trunk* ; but towards the *Basis* thereof, 'tis divided into Three Main Branches ; the middlemost of which, runs directly into the *Plume*, and the other Two, pass into the *Lobes* ; where dividing themselves into other smaller Branches, and those again, into more, and smaller : They at last terminate near the *Verges* of each *Lobe* ; in which manner being distributed, it becomes in each *Lobe*, a true and perfect *Root*. The *Seminal-Root* is so tender, it cannot be perfectly excarnated, as may the Vessels, in the Parts of an *Animal* ; yet by dissection, begun and continu'd, as above declar'd, its whole Frame and Distribution may be easily observ'd. Again, if you take the *Lobe* of a *Bean*, and length wise, pare off the *Parenchyma* by degrees, and in ~~very~~ thin Shives, many Branches of the *Seminal-Root* (which, by the other way of Dissection, were only noted by so many Specks) will (in some good distinction and intireness) appear. And tho' the *Seminal-Root* cannot be seen by Dissection in all *Seeds*, by reason of the smallness of most of them ; yet what Dissection cannot discover, ocular inspection (otherwise) will demonstrate, as in the next *Observ.* shall be shewn how. In the mean time, let us take notice, That every Plant has two (tho' not contemporaneous, yet successive) *Roots*, viz. its *Original* or *Seminal-Root* within its *Seed*, and its *Plant-Root* ; which the *Radicle* becomes in its growth ; the *Parenchyma* of the *Seed* being in some resemblance, that to the *Seminal-Root* at first, which the *Mould* is to the *Plant-Root* afterwards, and the *Seminal-Root* being that to the *Plant-Root*, which the *Plant-Root* is to the *Trunk*.

Eighthly, The same Ingenious Author observes, That the
general

general cause of the growth of any *Seed*, is Fermentation; and that the *Seed* lying in a convenient *Mould*, the *Sap* (wherewith it is fed) passeth through the outer *Coats*, than through the *Cuticle*; and lastly, through the *Parenchyma*; and so having been filter'd, and duly prepar'd, by passing through all these; it next enters all the Branches of the *Seminal-Root*, and from them passeth (by the Two main Branches) into the *Radicle*; which is thereby made to shoot forth, and take root in the Earth, and so is become the true *Root* of the *Plant*; which being done, the motion of the *Sap* is inverted; it being now drawn by the *Plant-Root*, and from thence, sent into the *Plume* (by the middlemost of the three Main Branches of the *Seminal-Root*, mention'd in the Seventh Section of the Seventh *Observation*) which being thus fed, it grows, and becomes the *Trunk* of the *Plant*; but part of the *Sap* passeth (by the two *Collateral* Main Branches of the *Seminal-Root*) into the *Lobes* of the *Seed*; which being thus fed, do, for some time, augment themselves and really grow. For excepting *Corn* (whose *Seed* is not divided into *Lobes*) and some other *Seeds* (as the Great *Garden-Bean*, which tho' divided into *Lobes*, does not bring them up above Ground) I say, excepting a few of these two kinds, all other *Seeds* whatsoever (which I have observ'd) their *Lobes* not only continue firm upon the Vegetation of the *Plume*, but also mount up above the *Mould*, together with it: For in all *Seeds*, which spring up with *Diffimilar-Leaves* [as they are call'd, first appear above Ground, from their being unlike those which the *Plant* afterwards bears] the two (for the most part two) *Diffimilar-Leaves* are the very *Lobes* of the *Seed* divided, expanded, and thus advanced. These *Diffimilar-Leaves* grow for some time, and then wither away. Some *Plants* have no *Diffimilar-Leaves*; and the reason is, either, because the *Seed* riseth not above ground (as *Garden-Beans*, *Corn*, &c.) or else upon rising; the *Lobes* are little alter'd, as *Lupines*, *Pease*, &c. And some *Plants* have more *Diffimilar* Leaves than two; as *Cresses*, which have six (as the ingenious Mr. *Sharrocks* also observes) the reason whereof is, because the *Main-Body* of the *Seed*, is not divided into Two, but Six distinct *Lobes*, as I have often counted. Lastly, From those *Diffimilar-Leaves*, we have a Demonstration of the Being of the *Seminal-Root*; which since, through the likeness of its Colour to the *Parenchyma*, or the smallness of the *Seed*, it could not by dissection, be observ'd, except in some few. Nature has here provided us a way of viewing it in the now effoliated *Lobes*, nor of One or Two *Seeds*, but of Hundreds; the *Seminal-Root*, visibly branching it self towards the *Cone* and *Verges* of the said *Lobes*, or now *Diffimilar-Leaves*.

Ninthly, Our Ingenious Author proceeds to make *Observations* on the *Root* of a *Plant*; which (by Dissection) he finds, substantially one with the *Radicle*, as the Parts of an *Old Man* with

with those of a *Fœtus*. And in the *Root* he takes notice of Five Parts, viz. Its *Skin*, *Cortical-Body* *Lignous-Body*, *Insertments* or *Insertions*, and its *Pith*.

Tenthly, The First Part he takes notice of, in his Dissection of the *Root* of a *Plant*, is its *Skin*, which he observes to have its *Original*, from that part of the *Cuticle*, that covers the *Radicle* of the *Seed*: For upon the Shooting of the *Radicle* into a *Root*, the *Cuticle* that covers it, is co-extended, and becomes the *Skin* of the *Root*.

Eleventhly, The next part of the *Root* he takes notice of, is its *Cortical-Body*; which he observes to have its *Original* from the *Parenchyma* of the *Seed's Cuticle*: For the *Radicle*, being by Vegetation Augmented and prolonged into a *Root*, the *Parenchyma* of it becomes the *Cortical-Body* of the *Root*. The *Contexture* of this *Cortical-Body*, he observes to be very much like that of a *Sponge*; it being a *Body Porous*, *Dilative* and *Pliable*. Its *Pores* (which are innumerable, and extream small) are extended much alike, both by the length and breadth of the *Root*.

Twelfthly, He observes, That next within the *Cortical-Body*, stands the *Lignous-Body*; which he observes to have its *Original* from that Part of the *Seminal-Root* of the *Seed* existent in the *Radicle*: For upon the Vegetation of the *Radicle*, That Part of the *Seminal-Root* existent in it, is co-extended, and becomes in the *Root*, the *Lignous-Body*. The *contexture* of this *Lignous-Body*, is much more close than that of the *Cortical*; and its *Pores* nothing near so numerous; yet many of them more open, fair and visible; and as to the *Situation* of the *Pores*, it is different from that of the *Cortical-Body*, for these are extended only by the Length of the *Root*; whereas, those are extended much alike, both for the Length and Breadth of the *Root*.

Thirteenthly, The next Part of the *Root*, our Author takes notice of, is the *Insertments* or *Insertions*; the existence whereof (says he) so far as we can yet observe, is sometimes in the *Radicle* of the *Seed* it self; I cannot say always. But as to its substantial Nature, we are more certain, that it is the same with that of the *Parenchyma* of the *Radicle*; being always at least, Augmented; and so, in Part, Originated from the *Cortical-Body*; and so, at second Hand, from the said *Parenchyma*: For in dissecting a *Root*, we find, That the *Cortical-Body*, doth not only environ the *Lignous*, but is also in many *Pieces* inserted into it, like so many *Wedges*, that thrust themselves quite through, as far as the *Pith*; and these *Pieces* I call *Insertments* or *Insertions*. These *Insertions*, tho' they are continuous through both the Length and Breadth of the *Root*; yet not so in all Parts, but by the several shootings of the *Lignous-Body*, are frequently intercepted. The *Pores* of the *Insertions* are (sometimes at least) extended somewhat more, by the Breadth of the *Root*, than by its Length.

Fourteenthly,

(14.) The next and distinct part of the Root, is the *Pith*, of which our Author observes, That the substantial Nature thereof is (as was said of the *Insertions*) the same, likewise [with that of the *Parenchyma* of the Seed: And according to the best *Observation* we have yet made, 'tis sometimes existent in its Radicle; in which the two main Branches of the *Seminal-Root* meeting, and being osculated together, are dispos'd into one round Trunk, and so environing part of the *Parenchyma*, make thereof a *Pith*; as in either the *Radicle*, or the young Root of the great *Bean*, or *Lupine*, may, I think, be well seen. But many times the *Pith* has its *Original* from the *Cortical-Body*, by the mediation of the *Insertions*; as in dissecting divers *Roots*, both of *Trees* and *Plants*, I have often observ'd. The Pores of the *Pith* (as those of the *Cortical-Body*) are extended both by the breadth and length of the *Root*, much alike; but they are, more or less, of a greater size than those of the *Cortical-Body*.

(15.) From the *Root*, our Author proceeds to the *Trunk*; in the Anatomy of which he observes five like parts as in the *Root*; and that they all have their *Original* from the *Plume* of the Seed, as those in the *Root* from the *Radicle*; viz. the *Skin* from the *Cuticle*, the *Cortical-Body* from the *Parenchyma*, &c. See the five precedent *Observations*.

(16.) He observes, That some things are better seen in the *Trunk*, than in the *Root*: As first, the Latitudinal shootings of the *Lignous-Body*, which in *Trunks* of several Years growth, are visible in so many Rings, as the *Tree* is Years old, as is commonly known: For in the *Trunk* (as also in the *Root*) several young *Fibres* of the *Lignous Body* shoot into the *Cortical* one Year, and the spaces betwixt them are fill'd up with more (I think not till) the next; and so, at length, they become a firm compact Ring; the ground-work of one Ring, and the perfection of another, being thus made concomitantly. Secondly, He observes, That the Pores of the *Trunk* are much more conspicuous than those of the *Root*: And here he observes,

(17.) That the Pores of the *Trunk* are of three sorts, greater, lesser, and least of all; and all continuous and prolonged by the length of the *Trunk*, which he proves (besides those of his own) by an *Experiment* made by the ingenious Mr. *Hook*, by filling up (suppose in a piece of *Charcole*) all the said Pores with *Mercury*, which appears to pass quite through them, as is visible by a good *Glass*. So that what we call the *Lignous Body*, or *Woody Part* of a Vegetable (whether *Plant*, or *Tree*) is nothing but a cluster of extraordinary small *Tubes*, *Pipes*, or *Vessels*.

(18.) The *Insertions* of the *Cortical-Body*, are also much more visible in the *Trunk* than in the *Root*: For in the *Trunk* of a *Tree* saw'd athwart, they are plainly discern'd, running from the Circumference towards the Centre. And in *Trees* saw'd

sawn length-ways into Boards (and those plain'd and wrought into leaves for Tables, Wainscot, Trenchers, and the like) there are many *Parts* observable by their greater *Smoothness* and *Shining*, which Work-men call *Chamleting*, or the *Quarter-Grain*; which are nothing else but parts of these *Insertions*. These *Insertions*, tho' (as has been said) of a quite distinct substance from the *Rignous Body*, and so no where truly incorporated with it; yet being in all parts, the one as the *Warp*, the other as the *Woot*, mutually interwoven together, they thus constitute one strong and firmly coherent Body; commonly called the *Wood of a Tree*.

Before I leave the *Trunks* of Vegetables, I shall inform the Reader, That about two Years after the Publication of his *Anatomy of Vegetables*, our Author, having got better *Microscopes*, publish'd a particular Treatise of the *Anatomy of Trunks*; wherein he observes,

(19.) That the *Trunk* or *Branch* of a *Tree* has three general parts, viz. the *Bark*, the *Wood*, and the *Pith*. And likewise every *Herbaceous-Vegetable*, has either the same three parts, or three parts analogous, viz. the *Cortical*, the *Lignous*, and the *Pithy Parts*. The *Bark* he observes to consist of two parts, viz. 1. the *outmost Skin*; and, 2. the *Main-Body*: 1. The *Skin* is generally compos'd of very small *Vesicles*, or *Bladders*, clustered together: That is, Originally; but as the Plant grows, the *Skin* dries up, and the said *Bladders* do very much shrink up and disappear. Amongst these *Bladders* of the *Skin*, there are usually intermix'd a sort of *Lignous Fibres*, or *Vessels*, which run through the length of the *Skin*; as in *Mallows*, *Nettle*, *Borage*, *Thistle*, and most Plants, which is not only argu'd from the toughness of the *Skin* by means of the said *Vessels*, but in some Plants may be plainly seen, as in *Teasle*: Whether they are *Air-Vessels*, or *Sap-Vessels*, is dubious. The *Skin* is, in some Plants, visibly *Porous*; but in none more than in the better sort of *Walking-Canes*; where the *Pores* are so big, as to be seen by the naked Eye. 2dly, The *Main-Body* of the *Bark* consists likewise of two Parts, viz. 1. The *Parenchyma*; and, 2. The *Vessels*. 1. The *Parenchyma* is made up of an innumerable company from small *Bladders* cluster'd together, differing in nothing of those aforesaid in the *Skin*; saving that they are much more larger and generally rounder. 2. The *Vessels* of the *Bark* are diversify'd in different Plants; but there are some things, wherein, in all sorts of Plants, they agree; as First, in standing most numerously, near the inner Margin of the *Bark*; Secondly, in being always, and only *Sap-Vessels*: I have view'd so many, that at least, I can securely affirm thus much. That if there be any heteroclital Plants, wherein they are found otherwise, there is not one in five hundred. Thirdly, In being always conjugated or braced together in the form of *Net-work*. Concerning the *Sap-Vessels*, says my Au

thor, I have one *Observation* further to subjoin, *viz.* As to their *Texture*, or *Formation*: I have already said, in my *Anatomy of Vegetables*, that the *Lignous parts* of *Vegetables* are *Tubulary Vessels*; that is, that the *Sap* is convey'd, by the length of a *Plant*, through an innumerable Company of small *Tubes*, *Pipes*, or *Vessels*. The Question may be yet further put, If the *stringy parts* of the *Bark* are made of *Tubes*, [or hollow *Pipes*] What are these *Tubes* themselves made of? I answer, Of *Lignous Fibres*: Which *Fibres* standing close together in a ring, make one *Tubulary-Body*, which I call the *Sap-Vessel* of a *Plant*. And 'tis very probable, that these *Fibres* themselves, are also *Tubulary*; that is, that a *Sap-Vessel* is a small *Tube*, made up of other, yet much smaller *Tubes*, set round together in a *Cylindrical Figure*. As if we should imagine a company of *Straws*, which are so many small *Pipes*, to be set round together, so as to make another great *Pipe*, answerable to a hollow *Cane*: The *Cane*, I say, is a *Sap-Vessel*, and the *Straws* as the *Fibres* whereof 'tis compos'd. By which also appears, the prodigious smallness of these *Fibres*. For a small *Sap-Vessel*, may, by an indifferent account, be reckoned fifty times smaller than a *Horse-Hair*. Allowing then but twenty of these *Fibres* to one *Vessel*, *viz.* Ten to compass its sides, and ten more to fill its Concave; then one of these *Fibres* must be a thousand times less than a *Horse-Hair*. Whether these *Fibres* are not made up of other *Fibres*, he only that made them knows.

(20.) The next general part of a *Tree* to be taken notice of, is the *Wood*; (which lieth betwixt the *Bark* and the *Pith*) And this *Part* our Author observes to consist likewise of two general *Parts*, *viz.* 1. The *Parenchyma*: And, 2. The *Vessels*. First, The *Parenchyma* of the *Wood*, in the *Trunks* of all *Trees* whatsoever, hath this property, to be dispos'd into many *Diametral-Rays*, plainly visible upon cutting a *Tree* athwart; it being the same which our Author, in his *Anatomy of Vegetables*, calls the *Insertions of the Cortical-Body*. As for the *Texture* of the *Parenchyma*, it is manifestly compos'd of small *Bubbles*, or *Bladders*; differing in nothing from those of the *Bark*, or *Pith*, but in their being much less: The *Bladders* in the *Bark* and *Pith* being as a *Purse* expanded, and these as the same *Purse* contracted, and drawn together by the *Strings*. Secondly, The *Vessels of the Wood*, tho' much diversify'd in different *Trees*; yet, in the *Trunks* and *Branches* of all *Trees*, they agree thus far, *viz.* in being always of two general kinds, *viz.* 1. *Sap-Vessels*; and, 2. *Air-Vessels*. First, The *Sap-Vessels* in the *Wood*, as well as those in the *Bark*, are compos'd of streight *Lignous Fibres*. As for the reason why I call them *Sap-Vessels*, it is to be understood, that every Year there grows a new Ring of *Sap-Vessels* on the inner Margin of the *Bark*; which Ring hardening by degrees, at the latter end of the Year is turned into a dry and hard

hard Ring of perfect Wood. So that the inmost Portion of the *Bark*, is annually added to the Wood: The *Perenchymous* part thereof making a new addition to the *Insertions* within the Wood; and the new addition to the *Lignous Body* betwixt which the *Insertions* stand. So that a Ring of *Sap-Vessels* in the *Bark* this Year, will be a Ring of Wood the next; and so another Ring of *Sap-Vessels*, and of Wood successively from Year to Year. As for the Structure of the *Sap-Vessels*, I have before noted, That they consist of straight concave *Fibres*, standing together in a Ring. Secondly, The *Air-Vessels* (which with the older *Sap-Vessels*, and the *Parenchymous Insertions*, altogether make up that which is call'd the Wood of a Tree) generally have a much larger *Bore* or *Cavity* than any of the *Sap-Vessels* in the Wood. In the Wood, I say; for in the *Bark* there are many *Sap-Vessels* bigger than the biggest *Air-Vessels*; not that they never contain any *Liquour*, but because all the principal Time of the growth of a Plant, when the *Vessels* of the *Bark* are fill'd with *Liquour*, these are fill'd only with a *Vapour* or *Vegetable Air*. As to the Texture of the *Air-Vessels*, they are compos'd of *Spiral Fibres*; I would resemble it to a Riband wound Spirally, and edge to edge, round about a Stick; and so the Stick being drawn out, the Riband should be lett in the form of an *Air-Vessel*. A Riband, I say; for that which upon the unvoing of the Vessel, seems to be a *Plate*, is really natural Riband; consisting of a certain number of round *Fibres* wove together.

(21.) The next general part of a Tree is the *Pith*; which, tho' it have a different Name from the *Parenchyma* in the *Bark*, and the *Insertions* in the Wood; yet, as to its Substance, it is the very same with them both: Whereof there is a double evidence, viz. the Identity of their Texture, and their Continuity. Their Texture shall be shew'd presently. As to their Continuity, it is to be noted, That as the *Skin* is continuous with the *Parenchyma* of the *Bark*, and this *Parenchyma* likewise, with the *insertions* of the Wood; so these *Insertions* again, running through the Wood, are also continuous with the *Pith*. So that the *Skin*, *Parenchyma*, *Insertions*, and *Pith*, are all one entire piece of Work, being only fill'd up diversly with the Vessels. The *Pith*, for the most part, if not always, is compounded of two Parts, viz. a *Parenchyma* and *Sap-Vessels*: The *Parenchyma* of the *Pith* is compos'd of *Bladders* which are of the very same with those in the *Bark*, and in the *Insertions* within the Wood; only these in the *Pith*, are of the largest size; those in the *Bark*, of a lesser, and those of the *Insertions* least of all. The Vessels of the *Pith* are usually postur'd so, as to make a Ring on the Margin of the *Pith*. They are of divers Kinds answerable to those in the *Bark*; as in *Wall-nut*, *Lym-Phedulists*; in *Fig*, *Lacteals*; in *Pine*, *Rosinous*, &c.

(22.) Our Ingenious and Learned Author further *observes*, concerning the *Trunks* of *Plants*, That tho' the common Opinion is, That the *Bark* is not continuous with the *Body* of the *Tree*, but only surrounds the *Body*, as a *Scabbard* doth a *Sword*, or a *Glove* the *Hand*; as also seems to be prov'd, by the easie slipping off the *Bark* of *Willow*, and most other *Trees*, when full of *Sap*, from the *Wood*: Yet, notwithstanding this, they are as truly continuous as the *Skin* of the *Body* is with the *Flesh*, viz. by means of the *Parenchyma*, which is one intire *Body*, running from the *Bark* into the *Wood*, and so uniting both together. And now, the reason why the *Bark* nevertheless slips so easily from the *Wood*, is, because, as I said before, most of the young *Vessels* and *Parenchyma Parts*, are there, viz. betwixt the *Wood* and the *Bark*, every Year successively form'd; and the said *Parts* being newly form'd, are as tender as the most tender *Vessels* of an Animal: And we may imagine how easily one may tear or break a thousand *Vessels* of an *Embryo*, of a *Womb*, or *Egg*.

(23.) Again, our Author *observes* in general, concerning *Trunks*, That all *Shrubs* have a greater number of *Air-Vessels*, and those of a smaller size than those in the *Trunks* of *Trees*.

(24.) And lastly, our Author *observes*, That the *Trunks* of different *Trees*, &c. have different *Qualities*, whereby they are fitted for different *Mechanick Uses*, as *Hardness*, *Softness*, *Fastness*, *Cleavesomeness*, *Toughness*, *Brightness*, *Durableness*, or any of the same *Qualities* compounded. The visible Causes whereof are observable, partly in the *Structure* of the several *Parts*; viz. the *Insertions*, *Sap-Vessels*, and *Air-Vessels*; as to the *Number*, *Size*, or *Portion* of any of them: And partly in the *Nature* of the *Parts*; I mean such as is manifest to *Sense*. According to our distinct observing of all which Causes, we may understand wherefore any *Wood* is made use of for this, or that purpose: And also, wherein fitly to apply it to further Use. In order to which, A compleat History of the *Mechanical Uses* of *Vegetables*, would very much conduce. I shall for the present give some Instances.

As First: Some Woods are soft, as *Deal* and *Sallow*, yet from different Causes. *Deal*, from the great porosity of the *Wood* it self, or the large *Pores* among the *Sap-Vessels*. But *Sallow*, not from the Porosity of the true *Wood*; but the great number of *Air-Vessels* spread all over it. For the same Cause, tho' they are both soft, yet will not they serve for the same purposes; *Sallow* being well wrought upon, which way so ever you cut it: But *Deal*, especially the white *Deal*, if it be cut cross, it tears, and will never Polish or work smooth.

Again, In *Sallow*, by the equal spreading of the *Air-Vessels*, the *Softness* is equal, or alike in all Parts. For which cause it makes an excellent *Coal* for *Painters Scribets*; because it doth not only make a *Light*, but every where a certain *Stroak*; and so doth not disturb the even Motion of the Hand. For the same Cause, Shoe makers make use of it for their *Carving-Boards*; because, being every where equally soft, it turns not the edge of their Knives; which *Deal* would presently do; because tho' very soft in some places, yet in others 'tis hard, viz. on the inner verge of every Annual *Ring of Wood*, where the old *Sap-Vessels* grow much more compact and close together.

Again, some *Woods* are soft, but not fast; others are both, as *Lime*, its *softness* depending on the numerosity and equal spreading of the *Air-Vessels*; its *fastness* on the closeness of the true *Wood* and the *shortness*, *smallness*, and *frequency* of the *Insertions*. For which Cause, it is of excellent use for many Purposes; and particularly for *small Sculpture*; such as may sometime be seen for the *Frames* of *Looking-glasses*, or of smaller *Pictures* in *Water-Colours*.

Again, some *Woods* are fast and hard, as *Elm*: Its *hardness* depending upon the closeness of the true *Wood*; its *fastness*, partly upon the same cause, partly upon the smallness of the *Insertions*, partly on the fewness of the *Air-Vessels* in proportion with the *Woods*, and partly on the thwart and cross *Position* of many of them. Hence it is, that *Elm*, of all others, is the most cross-grain'd Timber; that cleaveth so unevenly, to and fro, according to the cross position of the said *Vessels*. Hence also it cleaveth the most difficultly, even then when it is without any *Knots*: For which reason it is always used, as best, for the *Hub* of a great *Wheel*; as also, for *Water-Pipes*, and for *Pumps*. Not because it is the most durable *Wood*, but because it will not split or crack, either in the working, or afterwards. For the very same reason it is used for *Coffins*. So also the *Ladles* and *Soles* of a *Mill-wheel*, are made of *Elm*, lest they should split, but the other parts are made of *Oak*.

On the contrary, as *Elm* of all *Wood*, is one of the *fastest*; so of all hard *Woods*, *Oak* is the most cleavable, or split-teth the most easily. The cause whereof is, partly the largeness of the *Insertions*, and partly the *Diametral*, or radiated *Position* of most of the *Air-Vessels*: Upon both which accounts, where-ever a crack is begun, it is easily continued throughout the *Diameter* of the *Trunk*.

Again, some *Woods* are hard, fast and tough. So is *Ash*, and especially *Beech*, hard and fast, from some of the same Causes as *Elm*; tough, not from the *Structure*, but from the Nature of the *Parts*, viz. as being a less *Oiley Wood*, and so not brittle. Wherefore *London-Cars* have the *Rings* of their *Wheels* of *Beech*; because it tears more difficulty than even

Ash it self. Whence also for *large Screws*, there is no *Wood* like it; but for *small Skrews*, or about an Inch in Diameter, *Birch* is the best; as being, tho' not so hard, yet more tough.

The more *brittle* a *Wood* is, 'tis likewise usually the most *durable*. So *Oak*, which is not a *tough*, but very *brittle Wood*, is almost as *durable* as any. Whereas *Beech*, *Birch*, and the like, altho' very *tough*, yet for *duration*, are of no service; for there are no *Woods* will rot sooner: And therefore, tho' strong enough, yet unfit to make any standing parts of *Buildings*, or of *Furniture*; especially in wet and moist places. Because, being, as is said, *unoiley Woods*, they are apter to imbibe the moisture of a *Rank Air*; by which moisture, they either *Rot*, or breed *Worms*, which destroy them.

Hence it is, that what we call the *Heart of Timber*, as it is more *brittle*, so it is more *durable*; so, because more *Oiley*. So that which is call'd the *Sap of Oak*, is much more *tough* than the *Heart*, altho' the *Heart* be more *durable*. That is to say, the older the *Wood* is, the *Watery* parts are more evaporated, the *Oiley* still remaining as a kind of *Tincture* in the *Wood*. Even as we see, that the older *Seeds* of the same kind, are more *Oiley*, than those that are *Green* and *Young*; so that the *Oiley* or *Rotinous* parts of the *Sap*, are a kind of *Embalming* to the *Heart*, or older part of the *Tree*, securing it from the destructive Impressions of the *Air*. For the same Cause it is, that *Oak*, *Yew*, *Cocus*, *Guaiacum*, &c. which are *Oiley Woods*, have always much *Heart*; whereas *Birch*, *Alder*, *Beech* and *Maple*, which are very *Unoiley Woods*, have never any *Heart*.

From hence likewise we may understand the cause of the toughness of *Flax*: What we call *Flax*, being only the *Sap-Vessels* of the *Bark*. And generally the *Bark* of any *Tree*, as of *Willow* (whereof are usually made a sort of *Ropes*) is very *tough*; the *Vessels* being here younger, and less *Oilier* than in the *Wood*. So likewise *Hemp* is nothing else but the *Sap-Vessels* of *Bark* of the *Plant* so call'd. And *Scotch-Cloth* is only the *Housewifery* of the same parts of the *Bark* of *Nettles*.

Whence it is very probable, that there are many other *Plants*, as well as the above-named, whereof may be made good *Toe*. And of some, especially in some respects, better than of *Flax* it self. Because that even *Hemp*, altho' it will not make so fine a *Staple* as *Flax* (for all our fine *Hollands* are made of *Flax*) yet *Flax*, which is but of the same fineness as *Hemp*, will never, by all the *Art* yet known, be made so white as *Hemp* is made. The *Qualities* therefore of the best *Toe*, that can be in *Nature*, are, That the *Staple* be *long*, *small*, *tough*, and *white*. So that if in the *Bark* of any *Plant* we can find the *Qualities* to excel, we may be sure that 'twill

be of better use, in some respects, for making of Cloth than *Flax* it self.

Thus far our Author has *observed* of the *Structure* and *Nature* of *Trunks*. I proceed now (in the order mention'd in the first Observation) to the *Germen*, *Branch* and *Leaf*.

(25.) Concerning which, our Author *observes*, That the Parts of the *Germen* and *Branch*, are the same with those of the *Trunk*; the same *Skin*, *Cortical* and *Lignous Bodies*, *Insertment*, and *Pith* herinto propagated, and distinctly observable herein. For upon enquiry into the Original of a *Branch* or *Germen*, it appears, that it is not from the Superfice of the *Trunk*, but so deep, as to make both the *Cortical* and *Lignous Body* into it self; and that not only from its Circumference, but (so as to take the *Pith* in also) from its inner or central Parts; divers whereof may be commonly seen to shoot into the *Pith*. As to its standing in the *Trunk*, 'tis *observed* to be always betwixt the *Trunk* or *Elder Branch*, and the Basis of the Stalk of the *Leaf*; whereby it is not only guarded from the Injuries of any contingent Violence, but also from the most piercing Assaults of the Cold; so long, till in time 'tis grown, as larger, so more hardy. The manner and uses of the Position of every *Germen*, consider'd as after it becomes a *Branch*, has already been by the ingenious Mr. *Sharrock* very well *observ'd*; to whom, says my Author, I refer; of which anon.

(26.) Upon the prolongation of the *Germen* into a *Branch*, the *Leaves* are display'd: The Parts whereof are substantially the same with those of a *Branch*: For the *Skin* of the *Leaf* is only the ampliation of that of the *Branch*, being partly as the *accretion* of new, and partly by the *extention* of its already existent Parts, dilated, as in making of *Leaf-gold*, into its present breadth. The *Fibres*, or *Nerves*, dispers'd thro' the *Leaf*, are only the *Ramifications* of the *Lignous Body*, or *Wood* of the *Branch*. The *Parenchyma* of the *Leaf* which lies betwixt the *Nerves*, and, as in *Gentlewomen's Needlework*, fills all up, is nothing else but the *continuations* of the *Cortical-Body*, or inner part of the *Bark*, from the *Branch* into it self; as in most Plants with a fat *Leaf* may easily be seen.

(27.) The *Nerves* or *Fibres* of the *Leaf* neither shoot out of the *Branch*, nor *Trunk*, nor stand in the *Stalk* of the *Leaf*, in an even Line; but always in either an Angular, or Circular Posture, and usual'y making either a Triangle, or a Semi-Circle, or Cord of a Circle; as in *Cycory*, *Endive*, *Cabbage*, &c. may be *observed*: And if the *Leaf* have but one main Nerve, that also is postur'd in a Circular or Lunar Figure; as in *Mint*, and others. The usual number of these *Nerves* or *Fibres*, is three, five, or seven. And these *Fibres* in the *Stalk* or all insculated in the *Leaf*, with very many Sub-divisions, according as these *Fibres* are insculated near, or at, or shoot

shoot directly to the edge of the *Leaf*, is it even or scallop'd. Where these inoculations are not made, there we have no *Leaves*, but only a company of *Ramulets*, as in *Fennel*.

(28.) Every *Bud*, besides its proper *Leaves*, is covered with divers leavy-*Pannicles*, or *Surfoyls*; which, what the *Leaves* are to one another, are that to them all, viz. A Protector from the injuries of the Weather: For not opening, except gradually, they admit not the Weather, Wet, Sun, or Air, to approach the *Leaves*, except by degrees respondent, and as they are leisurely inur'd to bear them. Sometimes, besides *Surfoyls*, there are also many *Interfoyls* set betwixt the *Leaves*, from the Circumference to the Centre of the *Bud*; as in the *Hazel*. And sometimes the Membranes of the *Leaves*, by continuation in their first forming, are drawn out into so many *Mantles* or *Veils*; as in *Docks*, *Snake-Weed*, &c.

(29.) Upon the *Leaves* of divers Plants, two Productions shew themselves; viz *Hairs* and *Globulets*: Of *Hairs*, only one Kind is taken notice of, altho' they are various; ordinarily they are plain, which when fine and thick set, as on most hairy *Buds*; or fine and long, as on those of the *Vine*, we call them *Down*.

But sometimes they are not plain, but branched out from the Bottom to the Top, reciprocally on every side, in some resemblance to a Stag's-Horn; as in *Mullen*. And sometimes they are *Astral*, as upon *Lavender*, and upon some other *Leaves*, and especially those of *Wild-Olive*; wherein every *Hair* rising in one round entire Basis a little way above the Surface of the *Leaf*, is then disparted, Star-like, into several; four, five, or six Points, all standing at right Angles with the said perpendicular Base.

Globulets are seen upon *Orach*, both Garden and Wild; and yet more plainly on *Mercury*, or *Bonus Henricus*. In these, growing almost upon the whole Plant, and being very large, they are by all taken notice of. But strict Observation discovers, that those *Globulets* are the natural and constant Off-spring of very many other Plants. Both these *Globulets*, and likewise the diversity of *Hairs*, I find the Learned Mr. Hook has already observed. They are of two Kinds, *Transparent*, as upon the *Leaves* of *Hysop*, *Mint*, *Baum*, and many more: *White*, as upon those of *Germander*, *Sage*, and others. All which, tho' the naked Eye will discover, yet by the help of *Glasses* we may observe most distinctly.

(30.) Next our Author proceeds to the *Flowers*, in which he observes three general Parts, viz. the *Empalement*, the *Filiation*, and the *Attire*. I call that the *Empalement*, says he, which is the outmost part of the Flower enclosing the other two.

The *Empalement* is compounded of three general Parts, the *Skin*, the *Cortical*, and *Lignous-Body*; each *Empaler*, where there are divers, being as another little Leaf; as in those of a *Quince-Flower* (as oft as they happen to be overgrown) is well seen. As likewise in the *Primrose*, with the Green Flower, commonly so called, tho' by mistake; for that which seems to be the *Flower*, is only the more flourishing *Empalement*, the *Flower* it self being White; but the continuation of all the three aforesaid Parts into each *Empaler*, is discoverable, I think, no where better than in an *Artichoke*, which is a true *Flower*, and whose *Empalers* are of that amplitude, as fairly to shew them all: As also, that the Original of the *Skin* of each *Empaler* is not distinct from that of the rest; but to be all one piece, laid in so many Plaits, or Duplicatures, as there are *Empalers*, from the outermost to the inner and most central Ones. But some Flowers have no *Empalements*, as *Tulips*; and on the contrary, *Carnations* have not only an *Empalement*, but that (for more firmitude) of one piece.

(31.) The *Foliation* of the *Flower* is also of the same substantial Nature with the green Leaf; the *Membrane*, *Pulp*, and *Fibres* whereof, being, as there, so here, but the continuation of the *Skin*, the *Cortical*, and *Lignous Bodies*.

As upon the *Green Leaves*, so upon the *Flowers* are *Globulets* sometimes seen; as upon the Backside of that of *Emela*; but on none more plainly than on that kind of *Blataria* with the white Flower, where they are all transparent, and growing both on the Stalk and Leaves of the Flower, each shewing likewise its *Peduncle* whereon it is erected.

(32.) The *Attire* of a *Flower* our Author finds to be of two kinds, viz. 1. *Seminy*; and, 2. *Florid*. 1. That which I call *Seminy*, is made up of two general Parts, *Chires* and *Semets*, one upon each *Chire*.

These *Semets*, especially in some Flowers, look like so many little *Seeds*, but are quite another thing: For upon enquiry, I find, that tho' they seem to be solid, yet are they really hollow, and have their Concavity fill'd up with a great number of minute *Particles*, in the form of a *Powder*: And tho' this be common to all *Semets*, yet in some, and particularly in those of a *Tulip*, being larger, is more distinctly observable.

These *Semets* are sometimes fastened so, as to stand erect above their *Chires*, as those of Lark-heel: Sometimes, and I think usually, so as to hang a little down in the Manner and Figure of a Kidney, as in Mallows. Their side or sides, which at first are entire, at last crack asunder, sometimes with a single, but most times with a double Cleft or Crack, out of which it is that they disburse their Powders. The *Particles* of these Powders, (tho' like those of Meal or other Dust)

Dust) appear not easily to have any regular shape; yet upon strict *Observation* (especially with the assistance of an indifferent Glass) it appears that they are nothing else but a congeries of so many perfect little Globes or Globulets: That which obscures them is their being so small. In *Dogs Mercury*, *Brage*, and very many Plants, they are extremely so. In *Mallows*, and some others, they are more fairly visible.

Some of these *Powders* are yellow, as in *Dogs-Mercury*, *Goats-Rue*, &c. and some of other Colours: But most of them, I think, are White; and those of yellow *Henbane* very elegant; the disbur's'd Powder whereof, to the naked Eye, is white as Snow; but through a Glass each Globulet appears as transparent as Crystal.

Secondly, The *Florid Attire* is vulgarly known by the blind and rude Name of *Thrums*; as in the Flowers of *Marrigolds*, *Tansie*, &c. How adequate its imposition is, *Observation* will determine: For the several *Thrums*, or more properly *Suits*, whereof the Attire is made up, however else they may differ in various Flowers, in this they agree, that they are ever consistent of more than one, sometimes of two, and for the most part of three Pieces (for which I call them *Suits*) and each piece of a different, but agreeable and comely form.

The outer part of every Suit, is its *Florit*; whose *Body* or *Tube* is divided at the top, like that of *Cowslip*, into divers distinct Leaves; so that a *Flore* is the Epitome of a *Flower*; and is all the *Flower* that many Plants, as *Mugwort*, *Tansie*, and others, have. What the learned Dr. *Brown* observes of the Number *Five*, as to the Leaves of the *Flower*, is still more universally holding in these of the *Floret*.

Upon the Expansion of the *Floret*, the next part of the *Suit*, is from within its *Tube* brought to light; which we may, with respect to that within it, call the *Sheath*: For this also, like the *Floret*, is a concave Body, in its shape very well resembling the fistulous Pouches of *Wake-Ribon*, or of *Dragon*.

The *Sheath*, after some time, dividing at the top, from within is concave, the third and innermost part of the *Suit*, the *Blade* advanceth and display it self. This part is not hollow as the other two, but solid; yet at its Point (not Originally, but after some time) is evermore divided into two halves. Upon the division of the said Point, there appears (as upon the opening of a *Semet*) a Powder of *Globulets*, which before lay enclosed up within its Clefts, and are of the same nature with those of a *Semet*, tho' not so copious: So that all *Flowers* have their *Powders* or *Globulets*. The whole *Attire* may in *Map weed*, *Blew-bottle*, &c. be observed.

(33.) Next our Author proceeds to the Fruit: Where he observes, That the general composition of all *Fruits* is one, that is, their *Essential* and truly *Vital Parts* are in all the same, and but the continuation of those which in the other parts of a *Vegetable*, we have already observ'd. Yet, says he, because by the different Constitutions and Tinctures of these Parts, divers considerably different Fruits result; I shall therefore take a particular view of the more known and principal of them, viz. *Apples*, *Pears*, *Plums*, *Nuts* and *Berries*.

(34.) An *Apple*, if cut transvers, appears constituted of four distinct Parts, the *Pith*, the *Parenchyma*, *Branchery* and *Core*. The *Pith* is only the dilation of the *Skin* of the *Bark* in the *Branch*. The *Parenchyma*, when full ripe, is a tender delicate Meat: Yet is but the continuation and amplification, or, as I may say, the swelth and superbience of the *Parenchyma* of the *Bark*; as upon the observation of a young *Apple* is evident. The *Branchery* is nothing else but the Ramifications of the *Lignous-Body*, through all the parts of the *Parenchyma*; the greater Branches being by the insculations of the less, like as in the *Leaf*, united together. The main Branches are usually fifteen; ten are spread and distributed through the *Parenchyma*, all enarching themselves towards the *Cork* or *Stool* of the *Flower*; the other five running from the *Stalk* in a directer Line, at last meet the former at the said *Cork*, and are there osculated with them. These five are originated from one; which running along the Centre of the *Stalk*, and part of the *Parenchyma* of the *Fruit*, is therein at last divided. To these the *Coats* of the *Kernels* are fasten'd. The *Coar* is originated from the *Pith* of the *Branch*; for the *Sap* finding room enough in the *Parenchyma*, through which to disperse it self all abroad, quits the *Pith*, which thereby hardens into a *Core*.

35. In a *Pear* there are five distinct parts, the *Pith*, the *Parenchyma*, *Branchery*, *Calculary*, and *Acetary*. The three former are here in an *Apple* much alike; saving that here the inner, or *Seed-Branches* are ordinarily ten, whereas they are but five in an *Apple*, as was before noted.

The *Calculary* (most observable in rough-tasted or Choak-Pears) is a congeries of little stony Knots: They are many of them dispersed through the whole *Parenchyma*; but lying more continuous and compact together, towards the centre of the *Pear*, surround the *Acetary* there in a somewhat Globular form. About the *Stalk* they stand more distant; but towards the *Cork* or *Stool* of the *Flower*, they still grow closer, and there, at last, gather (almost) into the firmitude of a Plum-Stone.

Within the *Calculary* lies the *Acetary*; 't's of a softer taste, and (by the bounding of the *Calculary*) of a Globular Figure.

(36.) In a *Plum* (to which the *Cherry*, *Apricot*, *Peach*, &c.

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ought to be prefer'd) there are four distinct Parts, the *Pill*, the *Parenchyma*, *Branchery* and *Stone*. The *Pill* and *Parenchyma* are, as to their Original, with these of an *Apple* or *Pear*, both alike: As likewise the *Branchery*; but differently ramified. In *Plums*, I suppose all, there are five main *out-Bran-ches*, which run along the Surface of the *Stone*, from the *Basis* to the Point thereof; four of them by the one Ridge, and one by the other opposite to it. In an *Apricot* there is five also; but the single Branch runs not upon the Surface, but through the Body of the *Stone*. There are likewise two or three smaller Branches, which run in like manner under the other Ridge for some space, and then advancing into the *Parenchyma*, therein disperse themselves. These latter sort in *Peaches* are numerous throughout: But notwithstanding the different disposition of the Branches of the Fruits afore-said; yet is there one Branch dispos'd in one and the same manner in them all: The entrance hereof into the *Stone* is at the *Basis*; from whence running through its *Body*, and still inclining or arching it self towards its concave, is at last, about its *Cone*, thereunto emergent, where the Coats of the *Seed* are appendent to it. Of the *Seed-Branch*, it's therefore observable, that after its entrance into the *Fruit*, 'tis always prolong'd therein to a considerable length; as is seen, not not only in the *Apples*, &c. where the *Seed* stands a good distance from the *Stalk*; but in *Plums* likewise, where it stands very near it; in that, here the *Seed-Branch*, as is said, never strikes through the *Stone* into the Coats of the *Seed* directly, but above its *Cone* or remoter end.

The *Stone*, tho' it seem a single Body, yet it is compounded of different ones: The inner part thereof, as it is by far the thinnest, so it is the most Dense, White, Smooth, and Simple. The Original is from the *Pith*; difficult, but curious to observe: For the *Seed-Branch*, not striking directly and immediately quite through the *Basis* of the *Stone*, but in the manner as is above described, carries a considerable part of the *Pith*, now gather'd round about it, as its *Parenchyma*, along with it self; which, upon its entrance into the Concave of the *Stone* about its farther End, is there, in part, spread all over it, as the Lining thereof.

(37.) In a *Nut*, to which an *Acorn* is analogous, there are three general Parts, viz. The *Cap*, *Shell*, and *Pith*. The *Cap* is constituted of a *Pill*, and *Parenchyma*, deriv'd from the *Bark*, and *Ramulets* from the *Lignous-Body* of the *Branch*. The *Shell* likewise is not one simple Body, but compounded. The superficial part thereof is Originated from the *Pill* or *Skin* of the *Cap*, from' the inside whereof it is in a Duplication produc'd and spread over the *Shell*, which if you look at the *Basis* of the *Shell*, is farther evident; for that being continuous with the *Parenchyma* of the *Cap*, without the interposure of the *Skin*, the said superficial Part is there wanting.

wanting. The thicker and inner part of the *Shell* consisteth of the same *Parenchyma* as that of the *Cap*, with a congeries of Precipitations fill'd up, as in a *Stone*: And as the *Lignous Body* is branched in a *Stone*, so, with some difference, in a *Shell*. The outer *Branches*, or *Ramulets*, are numerous, each rising out of the *Parenchyma* of the *Cap*, and entering the *Shell* at the circumference of its *Basis*, and so running betwixt its superficial and inner Parts towards its *Cone*, in a *Round*. The inner, or *Seed-Branch* is single, entering in, as do the other, at the *Basis* of the *Shell*, but at the *Centre* thereof; from whence it runs not through the *Shell*, as in *Plums*, through the *Stone*; but through the *Pith*, as far as the *Cone*, where the *Coats* of the *Seed* hang appendent to it.

(38.) A *Berry*, as a *Gooseberry* (to which *Currans*, *Grapes*, *Hippes*, &c. are to be referr'd) consists, besides the *Seed*; of the three general parts, *Pill*, *Parenchyma* and *Branchery*: The *Pill* is originated as in the foregoing Fruits; the *Parenchyma* is double, as likewise in some other *Berries*; the outer is commonly, together with the *Pill*, call'd the *Skin*, and is that part we spit out, being of a soure taste. As the *Pill* is originated from the *outer*, so this from the *inner part* of the *Bark*; and accordingly the *Pores* thereof may be observed plainly of a like shape with those both of the *Cortical Body* and *Pith*. The *Inner* is of a sweet taste, and is the part we eat: It is of a constitution so lax and tender, as it would seem to be only a thicker or jelly'd Juice; altho' this likewise be a true *Parenchyma*, something like that of an *Orange* or *Lemon*, with its *Pores* all fill'd up with *Liquor*. The *Branchery* is likewise double; the *Exterior* runs betwixt the *Pill* and outer *Parenchyma* in arched Lines, from the *Stalk* to the *Stool* of the *Flower*. These *outer Branches*, tho' of various Number at the *Stalk*, yet at the *Cork* are usually ten principal ones; five for the *Leaf* of the *Flower*, and five for the *Chives*. The inner main *Branches* are two, diametrically opposite to each other, and at the *Cork*, with the other inosculated. From these two are Branched other smaller, every one having a *Seed* appended to it, whose *Coats* it enters by a double *Filament*, one at the *Basis*, the other at the *Cone*. They are all very white and turgent, and by a slant cut may be observ'd to be Concave; thus representing themselves Analogous to so many true *Spermatick-Vessels*.

(39.) Lastly, our Author proceeds to its *State of Generation*: Wherein he takes notice of what was either not distinctly existent; or not so apparent, or not so intelligible in its *State of Generation*. And here he observes, That the two general Parts of the *Seed*, in its *State of Generation*, are its *Covers* and *Body*. The *Covers* in this State are usually four: The outmost we may call the *Case*: 'Tis of a very various form;

Parag. 1. in AGRICULTURE, &c. III

form; sometimes a Pouch, as in *Nasturtium*, *Cochlearia*; sometimes a Cod, as in *Pulse*, *Galega*; sometimes not entire, but parted, or otherwise open, as in *Sotrel*, *Knot-Grass*, with many other Forms; I think always more Heterogeneous to that of the Seed, by which it differs from the proper Coats. To this the Caps of Nuts, and the Parenchyma of Fruits, are Analogous.

The two next are properly call'd the Coats: In a Bean, especially, and the like; (from whence, to avoid Confusion, the Denomination may run common to the responding covers of other Seeds.) The colour of the outer is of all degrees, from white to the blackness of Jet: Its Figure sometimes Kidney'd, as in *Alcea*, *Behen*, *Poppy*; Triangular, as in *Polygonatum*, *Sorrel*; Triangulo-Spherical, as in *Mentha Melissa*; Circular, in *Lencium*, *Amaranthus*; Globular, in *Napus Asperula*; Oral, in *Speculum Veneris*, *Tithymalus*; Semy-Globular, in *Corander*; that which we take for a single round Seed, being a Conjugation of two; Semy-Oval, in *Anise*, *Fennel*; Hastal in *Lactuca*; Cylindrical, as, if I mistake not, in *Jacobaea*; Pyramidal, in *Geranium*, *Althaea*, &c. with many other differences.

'Tis sometimes glistening, as in *Speculum-Veneris*; rough-cast, in *Catanance*; studded, in *Behen*, *Blattaria*; Favous, in *Papever*, *Antirrhinum*, *Lepidium annuum*, *Alcea vesicaria*, *Hysciamus*, and many more, before the Seeds have lain long by; Pounced, in *Phalangium cretae*, *Lithospermum*; Ramify'd, in *Pentaphyllum fragiferum*, *Erethum majus*; resembling the Fibres of the Ears of the Heart; some just *Quinquinerval*, as in *Anisum*, and many more, the Lignous Body being in five main Fibres branched therein.

The Covers of not only *Quince-Seeds*, and those of *Psyllium*, (more usually taken notice of) but those also of *Horminum*, *Nasturtium*, *Eruca*, *Camelina*, *Ocimum*, and divers others, have a Mucilage; which, tho' it be not visible when the Seeds are thoroughly dry, yet lying a while in some warm Liquor, or only on the Tongue, it swells more or less, and upon them all fairly shews it self. On that of *Ocimum* it appears grayish; on the other, transparent; and on that of *Nasturtium Hortense* very large; even emulous of the inner Pulp surrounding a *Gooseberry-Seed*. The putting of *Clary-Seed* into the Eye, may have been brought into use from this Mucilage, by which alone it may become Medicinal.

All Seeds have their outer Covers open, either by a particular Foramen, as in Beans, and other Pulse, as has been said; or from breaking off the Seed from its Peduncle, or Stool, as in those in Cucumbers, Cycory, &c. or by the entering and passage of a Branch or Branches, not only into the Concave thereof near the Cone, but also through the Cone it self; as in Shells and Stones.

For the sake of this *Aperture* it is, that *Acorns*, *Nuts*, *Beans*, *Cucumbers*, and most other *Seeds*, are in their *Formation* so placed, that the *Radicle* still standeth next to it; that, upon *Vegetation*, it may have a free and ready passage into the *Mould*.

The Original of the outer *Coat*, though from parts of the same substantial Nature, yet is differently made. In a *Plum*, the *Seed-Branch*, which runs, as is described, through the *Stone*, is not naked; but, as is said, invested with a thin *Parenchyma*, which it carries from the *Stalk* along with it; and which, by the *Ramification* of the said *Branch* within the *Stone*, is in part dilated into a *Coat*. That of a *Bean* is from the *Parenchyma* of the *Cod*; the superficial part of which *Parenchyma*, upon the *Peduncle* of the *Bean* becoming a thin *Cuticle*, and upon the *Bean* it self, a cartilaginous *Coat*.

The Original of the *inner Coat* of the *Bean* is likewise from the *inner Part* of the said *Parenchyma*, which first is spread into a long *Cake*, or that with which the *Seed-Branch* maketh the *Peduncle* of the *Bean*; under which *Cake*, there is usually a black *Part* or *Spot*; by the length of which, the *inner part* of the *Cake* is next inserted into the outer *Coat*, and spread all over the *Concave* thereof.

This *inner Coat*, tho' when the *Seed* grows old and dry, 'tis shrunk up, and in most *Seeds* so far as scarcely to be discerned; yet in its first and juvenile *Constitution*, is a very *Spongy* and *Sappy Body*; and is then likewise (as the *Womb* in a pregnant *Animal*) in proportion very thick and bulky; in a *Bean*, even as one of the *Lobes* it self; and in a *Plum* or *Apricot*, I think I may safely say, fifty times thicker than afterwards when it is dry'd and shrunk up, and can scarcely be distinguished from the upper *Coat*: Upon which account it is, in this *Estate*, a true and fair *Parenchyma*.

In this *Inner Coat* in a *Bean*, the *Lignous Body*, or *Seed-Branch*, is distributed: Sometimes, as in *French-beans*, throughout the whole *Coat*; as it is in a *Leaf*: In the great *Garden-bean*, upon its first entrance, it is bipartite, and so in the small *Branches* runs along the *Circumference* of the *Coat*, all meeting and making a kind of *Reticulation* against the belly of the *Bean*. In the same manner the main *Branches* in the outer *Coat* of a *Kirnel*, circling themselves on both *Sides*, from the place of their first entrance, at last meet and mutually inosculate.

The fourth and innermost *Cover*, we may call the *Secundine*, the sight whereof, by cutting off the *Coats* of an *Infant-bean*, at the *Cone* thereof, in very thin *Slices*, and with great caution, may be obtained. While unbroken, 'tis transparent; being torn and taken off, it gathers up into the likeness of a *Jelly*, or that we call the *Tredle* of an *Egg*, when over-boyled. This *Membrane* in larger or elder *Beans* is not to be found

found distinct, but becomes, as it were, the Lining of the inner Coat: But (as far as our enquiries yet discover) it may in most other *Seeds*, even full grown, be distinctly seen; as in those of *Cucumber*, *Colocynthis*, *Burdock*, *Carthamum*, *Gromwel*, *Endive*, *Mallows*, &c. 'Tis usually so very thin in the above-named, as very difficult to be discovered. In some *Kernels*, as of *Apricots*, 'tis very thick, and in some other *Seeds*: That all these have the Analogy of one and the same cover, which I call the *Secondine*, is most probably argued from their alike Natures, being all of them plain simple *Membranes*, with not the least Fibre of the *Lignous Body*, or *Seed Branch*, visibly distributed in them, as also from their Contexture, which is in all of them more close.

The Concave of this *Membrane* is fill'd with a most transparent Liquor, out of which the *Seed* is form'd, as in cutting a petite and *Infant-Bean*, may be seen; and yet better in a young *Walnut*. In *Beans* I have observed it to turn, upon boiling into a tender white *Coagulum*.

Through this *Membrane* the *Lignous Body*, or *Seed Branches* distributed in the inner Coat, at last shoot downright two slender *Fibres*, like two Navels, one into each *Lobe* of the *Bean*. The places where the said *Fibres* shoot into the *Lobes*, are near the *Basis* of the *Radicle*, and by their blackishness well enough remark'd: But the *Fibres* themselves are so very small, as scarcely to be discerned: Yet in a *Lupine* of the larger kind, both the places where the *Navel Fibres* shoot into the *Lobes* (which here from the *Basis* of the *Radicle* is more remote) and the *Fibres* themselves are fairly visible: For the *Seed Branch*, upon its entrance into the Coat of the *Lupine*, is presently divided into two *main Branches*, and those two into other less; whereof some underly, others aloft, run along the Coat, and towards its other end meet and inosculate, whereabout two opposite, shallow, round, and most minute Cavities (answerable to two Specks) of a cartilaginous gloss, one in either *Lobe* may be observed; which Specks are the ends of the said *Navel Fibres*, upon the ripening of the *Seed* there broken off. These *Fibres*, from the superficies of each *Lobe*, descend a little way directly down, presently each is divided into two *Branches*, one distributed into the *Lobes*, the other into the *Radicle* and *Plume*, in the manner as in Num. 7. of this Parag. was shewn.

(40.) Our ingenious Author having thus far considered the Structure of all the Parts of a Plant, in the natural order of their Vegetation; he proceeds more particularly to shew the method of their Vegetation. And here he observes, that the Course of the *Sap* (in a Plant) is by three different parts of the Plant, viz. The *Pith*, the *Wood*, and the *Bark*.

First the *Pith*, by which the *Sap* moveth the first Year, and only the first Year. Or, it is *Proprium quarto modo*, to the *Pith* of every Annual-growth, and to the *Pith* of such a growth

growth only, to be succulent. That is, whether of a *Sprout* from a *Seed*, or of a *Sucker* from a *Root*, or of a *Cyon* from a *Branch*: The *Pith* is always found the first Year full of *Sap*; but the second Year the same individual *Pith* always becomes dry, and so continues ever after.

The second Part by which the *Sap* moves *sub forma Liquoris*, is the *Wood*. Which yet is not in all *Plants*, but only in some, and visibly in few; as in the *Vine*: in which, I say, the *Sap* doth visibly ascend by the *Wood*. And this it doth not only the first Year, but every Year, so long as the *Vine* continues to grow. But altho' this ascent (of the *Sap*) by the *Wood*, be every Year, yet is it dry in the *Spring* for about the space of a Month, scil. in *March* and *April*,

There are many other *Trees* besides the *Vine*, wherein at the same time of the Year (and, perhaps, in all other *Trees* a little before or after) wherein, I say, the *Sap* ascendeth (tho' not so copiously, yet) chiefly by the *Wood*. For taking a *Branch* of two or three Years old, suppose of *Sallow*, and having first cut it transversly, if the *Bark* be then in the same manner crushed somewhat hard with the back of a *Knife*, near the newly cut end, the *Sap* will very plainly rise up out of the utmost *Ring* of the *Wood*. And if it be crushed in the same manner, about an Inch lower, it will ascend out of every *Ring* of *Wood* to the Centre. Yet at the same time (which is to be noted) there ariseth no *Sap* at all out of the *Bark*. Which shews the Error of that so common Opinion, That the *Sap* always riseth betwixt the *Wood* and the *Bark*: For in the beginning of the *Spring*, it riseth neither betwixt the *Wood* and *Bark*, nor in the *Bark*, but only in the *Wood*.

The third Part by which the *Sap* ascends, is the *Bark*, as may be observed in almost any *Branch*, cut cross in the late *Spring* and *Summer*; either as the *Sap* issueth spontaneously, or upon crushing as aforesaid. So that when the *Sap* ceaseth to ascend, *sub forma Liquoris*, by the *Wood*, then it begins to ascend by the *Bark*.

(41.) Besides the difference in *Time*, the *Original Parts* by which these two *Saps* ascend, are divers. For in the *Bark* it ascendeth visibly, only by the *Sap Vessels*, whereas in the *Wood*, it ascends only by the *Air-Vessels*.

(42.) Lastly, our Author observes, That the *Sap-Vessels* begin to be formed in the *Spring*; but the *Air-Vessels* not till the latter end of *Summer*, or thereabouts, at least, they appear not till about that time.

Thus far I have abridg'd the *Observations* of the ingenious Mr. *Grew*; I shall add some *Observations* (proper for this Paragraph) out of our Author.

(43.) All *Seeds* that I know (says Mr. *Sharrock*) have within their covers actually a *Neb* [which Mr. *Grew* calls *Radicle*. V. S. Obs. 4. and 7.] which answers to a *Root*, which

is joyned to *Leaves* more or less in number; betwixt the *Stalks* of (or amidst) these *Leaves* there is a *Bud*, *Eye*, or *Germen*, just opposite to the *Neb*, or initial *Root*, but by reason of its smallness, it is scarce discernable in many *Seeds*, till it begins to grow.

(44.) Most *Plants* in their coming up, have only two *Leaves* actually joyn'd to their *Neb*, which are commonly very unlike the common *Leaves* of the *Plant* (and therefore are called *Diffinular-Leaves*) of this sort are the *Flowers of the Sun*, *Edissarum Clypeatum*, *Cucumbers*, *Melons*, *Amaranthus*, *Thistles*, *Thlaspies*, *Mallows* of divers kinds, *Arch-Angels*, *Spurges*, *Nettles*, *Clary*, *Orach*, *Dill*, &c. *Parsley* has also two *Diffimilar Leaves*, but not much so. And *Melilot* has two *Diffimilar Leaves*; and one, if I mistake not, *Similar*.

(45.) Some *Plants* have more than two *Diffimilar Leaves* at their coming up; as *Cresses* have six. And some *Plants* have but one *Diffimilar Leaf*, as *Anemonies*, *Tulips*, *Fritellaries*, and all the bulbous Spring *Flowers* that I have observed.

(46.) I have taken notice, that *Carnations* come up, sometimes with three, sometimes with four *Leaves*, tho' the most have but two, and it is Mr. Bobart's *Observation*, That such as come up with more than two *Leaves*, prove double *Flowers*; which if it generally holds true, it were a commendable way to weed out all the rest at their first coming up; to avoid the labour of Culture of such *Plants*, as in the end will not prove advantageous for Profit or Pleasure.

(47.) If I am asked, whether each *Seed* has a complete Essence and distinct Form of its own? Nay, further, whether it be a true and perfect *Plant*? I must answer, That I have found it so to be, even more than an *Egg* a living Creature, and immediately nourishable: It has *Root* to grow; *Body* to bear the port of the *Plant*; *Bark* to direct the *Sap* to all its parts; and *Germen* or *Bud* to secure the means of future growth, and to shoot forth *Leaves*; which is all somewhat more than in the Winter the sturdiest *Oak* can boast of. Were it not so, I confess, that for all the cause and ways of Production, explain'd either by Sir Kenelm Digby, or other our noble Wits; I see no Reason, why (even granting the Sun, and all the Elements to have the operations suppos'd by them) their *Oak* should not bear Apples as well as *Acorns*; or why an *Acorn* should not produce a Tree with *Leaves* like a *Cabbage*, as well as those proper to the *Oak*: For those general causes they are wont to alledge, seem not to me, nor to any reasonable Man, sufficient to produce the particular Specification of those many thousand *Plants*; that in all Grounds and Climates, continue and keep their Natures, and produce their own Kind, without any notable difference.

(48.) The manner of the growth of *Plants* from the *Seed* is observed to be thus; by convenient moisture and heat, the *Neb* [or *Radicle*] strikes through the *Covers*, and goes directly down (if not impeded) in *Earth* or *Water*, a convenient way, ordinarily two or three Inches, in which time the *Leaves* either rowled up, or otherwise inclos'd (my Author means the *Plume*) break their bonds, and explicate themselves, being litted commonly a little higher by the growth of the *Stalk*, or lengthen'd *Neb*; and you may observe, that the growth above ground, at the first motion upward, is nothing proportionable to its motion downwards; which contradicts Sir *Kenelme Digby's* Hypothesis, in his Discourse of the *Vegetation of Plants*, Pag. 18, and 19. where he suppoles, that upwards, and towards the *Air*, will be the speediest as well as greatest growth of a *Plant*; his Reason is, because that way it meets the least resistance. But, tho' I am both a Person so excellently learned should be found mistaken in any Circumstance; yet, in all my *Experiece*, I find, that a *Bean*, or any other *Seed* that I know, being laid, suppose, half an Inch under the Surface of the *Earth*, will, at its growth, strike a *Root* two Inches downward, to one Inch it grows upward.

(49.) It is proved, by *Experience*, that there is every Year a new Coat of *Wood* made to every thriving *Tree*, by apposition of *Sap*, hardned into a thin Board (as I may call it) inso much, that I have known divers *Woodmen*, that would boldly assert the determinate number of Years, that any *Oak*, or other *Wood* has thrived in, by the number of those several distinct Rings of *Wood*, that are to be counted from the middle or centre of the *Tree*, to the outside of it, it being credited (and that I think with Reason) that every one of those Rings rose from the apposed and hardned *Sap* of every several Year.

(50.) As to the Situation of the *Leaves* of *Plants*, the learned Dr. *Brown* has made the *Quincunx* famous, which may with as great aptness be applied (and, I think, more universally) to the Situation of *Buds* or *Germens*.

This Figure (called the *Quincunx*) has its name from the numeral Letter V. because the Points therein are the same with the Points, or Angles in the said Letter; and because, that as the Letter is capable of infinite Multiplications; so is the Figure, and both in not unlike Fashions the Number thus, V. X. XX. XXX. The Figure thus,

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Of this *Quincunx* I shall propose three sorts, 1. The thicker, as in the Figure *a*. The thinner and less full of Points, are either obliquely set, as in the Figure *b*. or more strait, as in the Figure *c*.



The most thick sort of *Quincunx*, has its Examples rather in *Leaves* than *Buds*; for after this manner stand the *Leaves* upon most *Marragons* and *Lilles*, divers *Spurges* and *Sedums*, on which it is most visible when the Plants run up to Seed. *Trickmadam*, *Spurge-Lawel*, *Marsh-Mallows*, when the Stock is exceeding rank and big, for otherwise it is sufficed with the regulations of the third Figure: The *Leaves Fir-Tree*, *Pine-Tree*, &c.

The second, or oblique, and single *Quincunx*, may, for the most part, be observed, both in the *Buds* and *Leaves* that rise from *Trees*, and such other Plants whose *Stalks* are round; as in the *Oak*, *Elm*, *Hazel*, *Apples*, *Plums*, *Cherries*, *Pears*, *Willows*, *Sallows*, *Osiers*, *Black-Thorn*, *White-Thorn*, *Gorse-berrie*, *Currants*, *Roses*, *Fennel*, *Cichwy*, *Thistles* of most sorts, *Dock*, *Burdocks*, *Southern-wood*, *Rue*, *Seseli-Æthiopicum*, *Sweet-Maudlin*, *common-Mercury*, *Dulcamara*.

I find indeed, the learned *Gassendus* to have put *Apples* among those *Plants*, whose *Leaves* arise from the *Stalk* without order. *Prodeunt folia in quibusdam sine ordine ut in Malis, in quibusdam ordinate ut in Rosa*. But every Man's Eye (that marketh the situation of a *Bud* upon any fresh shoot of an *Apple*, that contains *Buds* enough to admit of the *Quincunx*) will be satisfied, that I have not err'd in my Observation: Nor do I account it an Error, that I affirm the *Buds* of *Roses* and *Apples* to observe the same manner of the *Quincunx*. The cause why *Gassendus's* Observation differs from mine, is, First, That he observed not the Figure of the Eruption of the *Buds* in *Apples*, nor, in truth, in *Roses*. Secondly, his Notion of a Leaf and mine, is different; I take those parts for several Divisions of the same Leaf, which he accounts for distinct Leaves: For whatsoever stands upon that *Stalk* which covers the *Bud*, is, in my account, part of the Leaf, because these parts all meet together in one *Stalk*, fall together in the Winter, and the edges of the *Stalk* seems dilated at the end where it joyns to the Stem of the Tree. And the like Divisions of Leaves may be seen in divers other *Plants*: As in *Tansy*, *Celandine*, *Argentine*, *Argimony*, *Valerian*, and in divers Leaves of *Trees*

as in the *Ash-Tree*, *Wallnut*, and very many others. And if any one would observe the order of *Leaves*, what I have set down here of *Buds*, will give him light in his inquiry. For most times, (tho' not always) the *Leaves* and *Buds* stand in the same order.

The Third direct and oblong *Quincunx*, is most observed in Plants of a squar-Stalk. as *Water-Betony*, *Fig-Wort*, *Lavander*, *Mints*, *St. John's Wort*, *Clowns-all-heal* *Rhus-Myrtifolium*, *Mother-Wort*, *Nep*, *Colus-Jovis*, Yet 'tis not unfrequently seen on other Stalks also, as the *Sycamore*, *Elder*, *Maple*, *Dog-Tree*, *Ash*, *Hysop*, *Nettles*, *Hemp*, *Willow-Weeds*, *Tree-Spurge*, *French-Mercury*, and *Scamony of Montpellier*.

And 'tis observed, That in divers of those Plants whose Stalks are set with Joynts, and those Joynts with a beautiful circle of *Leaves*, proper to each Plant, contrary to the *Quincunxial* Situation; the *Germens* notwithstanding are found to follow the order of this last mentioned *Quincunx*; as may be seen in *Madder*, *Goose-Grass*, and *Ladies-Bedstraw*.

And generally the *Leaves* that stand not according to the *Quincunx*, either stand in Joynts, in the fashion of the *Burgundian-Cross*, as on most sorts of *Madder*, *Ladies-Bedstraw*, *Cross-Wort*, *Wood-Proof*, &c. or in some other profitable, fit and beautiful Posture.

I may give notice, That to find these Methods, and to expose them to the Eye, a profitable way may be to clip off the Stalks of the *Leaves* near the Branch, especially in the first and most thick sort of *Quincunx*: In the second more single *Quincunx*, it may not be amiss to slit the Bark and take it off; for it being laid flat and plain, the *Quincunxial* order will the better appear: The third sort is visible to the Eye, as the Plants grow. These eight last Observations out of Mr. Sharrock's ingenious Treatise, call'd, *The History of the Propagating and Improvement of Vegetables*.

PARAGRAPH II.

Experiments and Observations of Sowing of Seeds, &c.

I. Of Seeds growing that are Worm-eaten.

TIs observ'd of all great Seeds; (*Beans, Pease, Kidney-Beans, Lupines, &c.*) that tho the Pulse, or thick part of the Grain (Mr. Grew calls it the *Parenchyma*) perish, i. e. be Rotten, or Worm-eaten; yet, if the *Neb* and *small, Leaves* (Mr. Grew calls it the *Radicle* and *Plume*) be entire, the Seed may prosper; as I have seen *Field-Beans*, that have been eaten through with *Worms*, prove good thriving Seed. Mr. Sharrock's *History of the Propagation and Improvement of Vegetables*.

2. Of Sowing of Colliflower and Cabbage Seed.

Colliflowers and *Cabbages* are commonly Sown about mid February; but 'tis observ'd by all I have enquired of, that the less of the Winter the *Cabbage*, or *Colliflowers* feel, the more subject they are to Caterpillars. (And therefore some sow them with good success in Autumn, and so they have young Plants to set out in the Spring.) Mr. Sharrock *ibidem*.

3. Of Sowing Beans and Pease.

Some Gardens will sow *Beans* and *Pease* about *Christmas* or soon after; but unless the Ground be situated towards the Sun, it signifies nothing to Sow so early; for I have several times observed (in Ground that lay inclining to the North) *Beans* and *Pease* Sown at the latter end of *March*, or *April*, have been ripe full as soon as (and have come up much thicker than) those that were Sown (in the same Ground) in *January*, or *February*. *Per Authorem*.

4. Of Sowing several Seeds in the same Bed.

It may be a Question, whether there is not, in some Cases, more caution to be used, and in others, more improvement to be made, than is vulgarly imagin'd in the setting of Plants

of different Natures in greater Propinquity or Distance. For it is an *Observation* of the Learned *Gassendus*, that not only hot Hearbs are made more cold, or brought nearer to a temperament, by being Sow'd or Planted in a cold Soyl, and cold Herbs made more hot, by being Planted in a hot Soyl; but also, that cold Herbs being Sow'd nearer hot ones, become more temperate, *e. g.* That the coldness of the Lettuce is corrected by being Sow'd among Onions. And in the same place he adds, That if you set *White Hellebore*, or the Herb *Mercury* near a *Vine*, the *Grapes* will acquire a purging Faculty. *Lib. de Plantis Cap. 3. de Facultatibus Plantarum.*

5. Another of the same.

It is an *Observation* of *Dodoneus* concerning the *Raphanus Montanus*, or great *Mountain-Radish*; That it has been found by *Experience*; That this Plant doth hinder the growing of the *Vine*, and being planted near it, doth cause the *Vine* to starve, or wither away. *Historia Plantarum, Lib. 5. Cap. 37.*

6. Another of the same.

Pliny asserts the same thing concerning *Vines*; his words are, *Quarundam Plantarum odor lædit Vites, &c. i. e.* The Nature of some Plants is, not to kill and destroy Trees out of hand, but only to hurt or offend them, either with their Smell, or else with the mixture of their own Juice with their Sap. Thus the *Radish* and the *Lawrel* do hurt the *Vine*, if they grow near it; for by *Experience* is it found, that if the *Vine* do grow near unto *Radish*, or *Lawrel*, she will turn her self away from them, as tho' she could not abide their strong Breath, &c. *Hist. Nat. Lib. 17. Cap. 24.*

~ Steeping Corn, &c. in some Liquor before it be Sown.

By the help of plain *Salt Peter* (says my Author) diluted in Water, and other fit earthly Substance that may familiarize it a little with the Corn, I have made the barrenest Ground far out-go the Richest, in producing a plentiful Harvest.

I have seen *Hemp-Seed* soaked in this Liqueur, that has in the due time, made such Plants arise, as for the tallness and hardness of them, seem'd rather to be *Coppice-Wood* of fourteen Years growth at least, than plain *Hemp*.

The Fathers of the Christian Doctrine at *Paris*, do still keep by them for a Monument, a Plant of *Barly*, consisting of 249 Stalks, springing from one Root or Grain, in which they counted above 18000 Grains of *Barly*. Nor is it barely the *Salt-Peter* imbib'd in the *Seed*, or *Root*, that causeth this fertility; no, that would be soon exhausted, and could not furnish matter to so vast a Progeny. The *Salt-Peter* there, is like a *Magnet* which attracteth a like *Salt* that fecundateth the *Air*; for as the *Cosmopolite* said, *There is in the Air a hidden Food of Life*. This Spirit then that is in the *Air*, is drawn (as it were by a *Load-Stone*) by a *saline Liquor* that is imbibed into the *Seed*.

In a *Villa* at *Rome*, I Sow'd some *Barly* thus prepar'd; and what with the *Dew*, and what with the *Air*, and what with the *Sun*, I should in the *Morning* (by that time the *Sun* had dryed up the superfluous *Moisture*) see sproutings up of a pure *Salt-Peter*, of a prodigious height all about, and over the *Seed* that lay slightly cover'd with the loose *Mould*. They would be above an *Inch*, nay, two *Inches* long, of the purest *Chrystalline Salt-Peter* that could be seen. And it is upon this Principle; that the *Pope* in his *State*, and the old *Duke of Bavaria* in his, did first make, and then nourish *Mines of Salt Peter*; whose *Roots* and *Quarries* are far different from other *Minerals*, for they are under foot in the *Earth*, but these over our heads in the *Air*. This is a pure *Extract* drawn by the *Sun-Beams*, from all the *Bodies* that he darteth his *Rays* upon, and sublimed up to such a height of place as leaveth all *Feculence* behind it, and is there in that exalted *Region* baked, and incorporated with these very *Beams* themselves, which did refine this *Extract* out of its drossy *Qar*.

And it appears by the ancient *Georgicks*, that the use of the steeping *Seeds* in *Salt-Peter*, is no new *Invention*.

*Semina vidi equidem multos medicare secentes,
Et Nitro prius, & nigra perfundere amurca,
Grandior ut fetus siliquis fallacibus esset,
Et quamvis igni exiguo properata maderent.*

Virgil Georgic. 1:

I have seen many to anoint their *Seed* with *Nitre* first, then *Lees* of *Oyl*, to spread.

Whence larger *Grain* the empty *Husks* did fill,
Which, with soft head did into ripeness swell,

Sir Knelm Digby's History of the Vegetation of Plants.

8. *Another of the same.*

I have heard some studious Practisers very confidently affirm, That if you steep your Corn for some certain Hours (but I could never yet find them all agree in the Time; for some prescribe twelve Hours, some eighteen, and some thirty six, you may try them all, and keep the best;) in Water, wherein good store of *Cow-Dung* has been imbib'd for certain days, (which Time you must also search, if you mean to be an exact Master) every day stirring the same (once or twice) together, before you lay in your Corn; and after this preparation, you Sow the same (tho' in barren Grounds) you shall have a most rich and plentiful Crop.

But this kind of Practice, *I have heard*, both maintain'd and impugna'd, both by Reason and Experience, and that by Men of good Judgment on both sides; but if I should give you mine own Experience herein, I must needs confess, that I could never yet find any *Truth* in this Secret, or any apparent difference between Corn thus Husbanded, and that which grew without any such help; yet will I not (for the credit of the Reporters) altogether discredit the Invention, for that, peradventure, might fail in the Nature of the Grain, or in the time of the imbibition. *Sir Hugh Platt's Jewel-House, of Art and Nature.*

9. *Another of the same.*

I have another Experiment of this to set down, which, because it was the practice of a Spiritual Lord (that died lately, and fell out very happily, as *I have been credibly informed* by one of his especial Officers, who, with divers others, was an Eye-witness of the same;) I will publish the same unto all Posterity, under such Credit, as I my self did first receive it. And therefore, whereas before (*V. S. Obs. 8.*) you steeped your Corn in Water, which had soaked out the Strength or Salt of the Dung; you must now mingle your Dung, your Water, and your Corn together, in a large Vessel, stirring the same well together (with a Staff) for one whole Hour at least; this work you may begin in the Afternoon, and towards Evening you must renew the Agitation, for half an hour or more; then let these Substances repose themselves all the Night following, and in the Morning, or sometime the next day, you must let the Water pass away by a Tap, according to the manner of the *Salt-Peter* Men: And when the Liqueur is sufficiently drain'd, then Mingle the Corn and Dung thoroughly well together, and after Sow the Dung and Corn so mixed, in a barren

barren and hungry Mould, and you shall have as rich a Crop as if the Ground it self had been dunged before. This *Experiment* was made in a hartless piece of Ground, which lacked also one Tith, and which no Man durst ever adventure to Sow with any Grain, and yet my Lord Bishop did, by this means, attain to a most plentiful Wheat Harvest. Sir Hugh Platt, *ibidem*,

10 *Another of the same.*

I have heard of a silly Swain, who passing over an Arm of the Sea, with his Seed-Corn in a Sack, by mischance at the Landing, his Sack fell into the Water, and so his Corn being left there till the low Water, became somewhat brakish; yet such was the necessity of the Man, as that he (notwithstanding he was out of all hope to have any good success thereby, yet not being able to buy any other, he) bestow'd the same Wheat upon his Plow'd Grounds, by the Advice of a Gentleman of good Worship (from whom I received the Report thereof) and in fine, when the Harvest Time came about, he Reaped a rich Crop of goodly Wheat, such as in that Year none of his Neighbours had the like. Sir Hugh Platt *ibidem*.

11. *Another of the same.*

Mr. Platt gives us a process of steeping Corn out of *Johannes Baptista Porta*, which he pretends to cause a wonderful Increase, which is, To take the Corn out of the middle of the Ear, and bathe it in sweet Oyntment, made with the Fat of old Goats, being mixed with Bacchus and Vulcan, [which our Author interprets to be Goats Dung, the older the better, moistened with Wine, or new Must, or, I rather judge, Lees of Wine] let their soft and even laid Bed be gently warm'd: [Which he also interprets to be the digging of the Land; and by warming, its probable he means Soyling or Watering it with some prepared rich Liquor.] See Mr. Platt's *Adam's Tool reviv'd*.

12. *Another of the same.*

The following compounded Liquour is much commended, and affirm'd to be Experimented by the Author, for steeping of Corn; which is thus, Pour into Quick and Unslaked Lime, as much Water as sufficeth to make it swim four Inches above the Lime; and unto ten pounds of the said Water poured off, mix one pound of *Aqua Vita*, and in that Liquor sleep,

steep or soak Wheat, or other Corn twenty four Hours; which being dry'd in the Sun, or in the Air, steep again in the same Liquour twenty four Hours more, and do it likewise the third time; afterwards Sow them a great distance one from another, viz. about the distance of a Foot between each Grain; so one Grain will produce 30, 36, 38, 42, nay, 52 Ears, and those very fruitful, with a Stalk equalling the Stature of a Man in height. *Hartlib's Legacy.*

13. *Another of the same.*

There was *Wheat* steeped in *Water*, mixed with *Cow-Dung*; other in *Water*, mixed with *Horse-Dung*; other in *Water*, mixed with *Chalk powder'd*; other in *Water*, mixed with *Soot*; other in *Water*, mixed with *Ashes*; other in *Water*, mixed with *Bay-Salt*; other in *Claret-Wine*; other in *Urine*; other in *Malmsey*; other in *Spirit of Wine*. The proportion of the mixture was a fourth part of the Ingredients to the *Water*; save that there was not of the *Salt* above an eighth part. The *Urine* and *Wines*, and *Spirit of Wine*, were simple without mixture of *Water*. The time of the Steeping was twelve Hours. The time of the Year *October*. There was also other *Wheat* Sown *Unsteeped*, but water'd twice a Day with *warm Water*. There was also other *Wheat* Sown *Simple*, to compare it with the rest. The event was, that those that were in the mixture of *Dung*, and *Urine*, and *Soot*, *Chalk*, *Ashes* and *Salt*, came up within six Days: And those that afterwards prov'd the highest, thickest, and most lusty, were, first the *Urine*, and then the *Dungs*; next the *Chalk*, next the *Soot*, next the *Ashes*, next the *Salt*, next the *Wheat Simple* of it self, *Unsteeped* and *Unwatered*; next the *Watered* twice a day with *warm Water*; next the *Claret-Wine*. So that these three last were slower in coming up than the ordinary *Wheat* of it self; and this Culture did rather retard than advance. As for those that were steeped in *Malmsey*, and *Spirit of Wine*, they came not up at all.

This is a rich Experiment for Profit; for, most of the Steepings are cheap things; and the goodness of the Crop is a great matter of Gain; and 'tis likely the goodness of the Crop will answer the earliness of the coming up, both being from the vigour of the Seed.

This Experiment would be tried in other Grains, Seeds and Kernels: For it may be some Steeping may agree best with some Seeds. It would be tried also with Roots Steeped as before, but for longer time. It would be tried also in several Seasons of the Year, especially the Spring. *Lord Bacon's Sylva Sylvarum.*

14. Of chusing Corn for Seed.

We see, says my Author, that most Men will make choice of the fairest, freest, plumpest, and weightiest Wheat for Seed, and they think that they do well in it; but observe it better, and make other tryals of it, and see what will come of it. Is the Fattest Ox, or Cow best to keep? But to instance in my own Element; Do the fattest stocks of Bees prove better, or the most Fruitful? No surely, I find that good middling Stocks that are mending, prove best, and swarm oftenest; and the very fat ones prove leaner, and sometimes die, but seldom swarm. It is the same in this Case, when Wheat is at the best, it doth soon decay, and become worse, yea, naught, and worse then naught. You shall see it come up in great Plenty, Blades enough and Straw enough, and shoots the Ear, and has its Corn in the Ear, but it suddenly perisheth, and dies in the Ear, and becomes naught, vile, dust, worse than the Earth, and of no use, putrify'd, dead and gone. You may see it at a stand, and dead in the Ear, the Ear gaping and staring, much differing from the other that has Life and Vigour in it. And if the Land be not in very good heart, much of your Wheat will be thus spoil'd, and the more comes up, the greater bulk, the more will perish and become black, and will soil all your good Wheat in Thrashing, and will make it black at the ends; and it has a damp and faintish smell with it; and, I think, is not wholesome to Eat; therefore pick, or lease it out of the Sheaf before you Thrash it, or you had need wash it well, and dry it after it is Thrashed, before you eat it. Therefore when your Wheat is very fair, plump and weighty, use that rather to spend in your House; for it yields more and better Flower; but for Seed chuse a middle size, not so great, nor yet of the smallest Rank, a middle sort.

Another Reason to prove that Wheat, is at the best decays, and that the middle size is best for Seed, you may see in this following Experiment, says my Author; but, I have inserted that Experiment in Paragraph 10, Observation 6. of this Chapter, as being more proper for that place. Mr. Remnant. Lib 2. Chap. 4.

15. Of Liming of Corn.

There is a Procedure mention'd (among Mr Speed's Notes) for Liming Corn that carries a good probability of advantage with it. First, The Grain was steep'd in strong Brine of Salt (that would bear an Egg) for twenty four Hours; and

and then being laid *Stratum super Stratum* with Lime, [that is, there was laid a Layer of Corn first, and then a Layer of Lime, then again a Layer of Corn, &c.] the Lime cleaved to the Wheat; and was Sowed on Ground, not worth two Shillings an Acre; the Effect was, That it bore as good a Crop of Wheat as ever was seen in *England*, and afterwards three Crops a Year of Clover exceeding good, one whereof was equal in value to a Crop of Wheat: *This being matter of Fact*, I believe it as to improvement by fertility, because the Brine works very considerably in small proportion, and Lime in this conjuncture may do well, both to Fertility and defence of the Grain against Grubs, and Insects, and Worms that abide in the Earth. *Sharrock ubi supra.*

16. *Of the change of Seed.*

The change of *Seed* from Grounds of a contrary Nature, is, by the Experience of Husband-men, found to be a very advantageous Improvement, and is thought to prevent *Smuttiness*. 'Tis the custom in *Buckinghamshire*, for those of the Vale, to buy their *Seed* from the *Chiltern*, on this account; and this *Experiment* is found profitable in *Wheat*, *Barley*, *Pease*, and all Field Grains, and not so only, but also in Garden-Plants. *Sharrock ibidem.*

17. *Of mingling Salt with Corn when Sowed.*

Before you Sow your Ground, do but only mingle two Bushels of *Bay Salt*, with four Bushels of Winter-Grain, and so disperse them together upon the Ground, and you shall find a good Increase of Corn, and the Land it self much meliorated and cleared of Weeds, as I have been very credibly inform'd, Sir Hugh Platt, *ubi supra.*

18. *Of the early or late Sowing of Corn, &c.*

Corn, or any other Grain, the longer it continues in the Ground, or the earlier it is Sown, *Ceteris Paribus*, the better laden it is, and the Berry more Plump, Full, and Weighty, and of stronger nourishment; as for Example, Winter Oats better than Summer Oats, Beans set in *February*, than those set in *March*, &c. (This *Observation* my Author affirms to have receiv'd from his honour'd Friend Mr. Walter Esq; of *Cuckfield*, in *Suffex*.) *M. Ray's Collection of English Words.*

19. Of a new way of placing Oxen in a Plow.

My honoured Friend, *Walter Barvel, Esq;* of *Cuck-field*, in *Sussex*, uses to Plow with his Oxen end-ways, or all in one File, and not Yoaked by pairs; whereby he finds a double Advantage. 1. He, by this means, loseth no part of the strength of any Ox, whereas Brestwise it is very hard, so evenly to match them, as that a great part of the strength of some of them be not rendred uselefs. 2. In this way, a wet and clay Ground is not so much poached by the Feet of the Oxen. *Mr. Ray, ibidem.*

20. Of Sowing Anni-feed.

Anni-Seeds may be propagated in *England*, as some have already Experienced, by Sowing them in *February*, between the Full and Change of the Moon, then strew new Horse Dung upon them, to defend them from the Frosts. Those will ripen about *Bartholomew-Tide*; then also may you Sow again for the next Year. *Systema Agriculturae.*

P A R A G R A P H III.

Experiments and Observations of
Manuring, Dunging and Soyling of
Land: And also of the Nature of
the Soyl proper for several Vegetables.

1. Of the Soyl best for Beans.

Beans require a low deep Ground and Waterish, not a dry, sandy, or gravelly Soyl; this is true of field, or Horse Beans; tho' I first took notice of the great difference in our London Gardens, where the Labourers, for their own eating, would give a third part more for a Measure of Beans from the former, than from the latter Soyl, who assured me, that from the same Seed and Care, Garden Beans have much

much more Meal, Pulp, or Kernel, and thinner skins in the moist, than in the dryer and less waterish Ground. *Mr. Sharrock's History of the Propagation and Improvement of Vegetables.*

2. *Of the goodness of Dungs washing away with Rain.*

All those simple Sots which leave their Muck heaps abroad, and subject to the Weather, shew themselves to be but mean Husband-men: For the Rain which falls upon those *Dung Hills*, doth wash away the Salt which dissolves with the Moisture; whereby the Dung being afterwards laid abroad upon the Land, doth little or no good. But if you will not believe *Me*, then mark how the Husband-man carrying his Dung to the Field, leaves each Load in a heap; and a while after comes and spreads it equally all over the Ground; and afterwards when the same Field happens to be Sowed with Corn, *thou shalt always find* the Corn to be more green and rank in those places where the same heaps were first laid (after they have layn there some reasonable time) than in any other place in all the Ground besides: And this comes to pass by reason that the Rain which fell upon them, carried the Salt through them into the Ground, which was under them. *Sir Hugh Platt's Jewel House of Art and Nature.*

3. *Of Denshiring; or Burn-beating of Land.*

I Observed, in a parcel of Field-Land of about three Acres, Denshired, or Burnt-beaten, in a very hot and dry Spring, of it self naturally Barren; and after the burning and spreading of the Ashes, where was the fertile Salt deprav'd of its corrosive sterile Quality, the Land was Plough'd very shallow, and *Barly* Sow'd therein about the beginning of *M.y.* in the very Ashes as it were (no Rain falling from the very beginning of cutting the Turf) yet, in thirty six hours the *Barly* was shot forth, and the Ground colour'd green therewith. *Mr. Worlidge's Systema Agriculturae.*

4. *Of Burning of Lands.*

The *Burning of Land*, or any other Operation of it by Fire, seems to be the greatest, tho' not the most universal Advantage to most of our Barren, Poor and Hungry Lands, as well dry as wet: The *Burning of the Ground it self*, seems to be of very ancient use; as appears by *Virgil*:

Sape

Sape etiam steriles incendire profuit agros. Georgi.

And *Burning of Wood*, and other combustible Materials on Land, is practis'd among the *Americans*, for the improvement of their Land; which is an Argument as well of their Natural Ingenuity, as of the Excellency and Advantage of the Improvement. *Gage's Survey of the West-Indies.*

5. Of Pigeons-Dung.

We find *Experimentally*, says my Author, That *Pigeons-Dung* Sown by the Hand on Wheat, or Barly, mightily advantageth it.

And again, *Pigeons*, or *Hens-Dung*, says he, is incomparable, one Load is worth ten Load of other Dungs; and therefore it is usually Sown on Wheat (or Barly) that lieth a far off, and not easily to be helped; 'tis extraordinary likewise on a Hop-Garden.

A Load of *Pigeons-Dung* is more worth than twenty Shillings in many parts; a very excellent Soyl for a cold moist-natur'd Land.

I have caus'd it to be Sown by Hand after the Grain is Sown, and in the same manner, and then Harrow'd in with the Grain, and received a very great Increase on poor Land,

I have known, saith *Platt*, a Load of *Pigeons-Dung* fetched sixteen Miles, and a Load of Coals given for it, which in the Soyl whence it was fetched, would have done more hurt than good for the Manuring of Land; yet where it was carried, it did as much good for the Fertilizing of Land, as double the Charges: In one Soyl it cur'd the Barrenness, and in the other it Poysoned the Fertility. *Mr. Worlidge's Systema Agriculturae.*

6. Of Soot and Pigeons-Dung.

Soot and *Pigeons-Dung* abounds much with volatile Salt; and *I have this Year* (upon a cold, moist Clay) seen excellent advantage to the Grass thereby, it being only strew'd thin on the Grass, before the Spring; but of the two, the Soot was the best. *Mr. Sharrock ubi supra.*

7. Of Burning Hop-Hawm, &c. to apply to the Hills of a Hop-Garden.

There can no better use be made of combustible Matters, than to burn them; and especially of the Hawm or Strings of
Hops

Hops, which burnt in the *Hop-Garden*, and the paring of the Turfs on the side of the Garden, or elsewhere, or any other Earth cast over it as it burns, and then more Hawm over that, and more Earth on that, as they use to say, *Stratum super firatum*, till all be done, either in one or several places, will make so excellent a Compost, to be applied to the *Hop-Hills*, that none can exceed it; which I my self have done. *Mr. Worlidge, ubi supra.*

8. Of Fern, or Brakes to mend Hop-Gardens with.

I could, says my Author, name a *Yorkshire* Knight, who bestows *Fern*, or *Brakes* (unrotted) in some good thickness, throughout all the Allies of his *Hop-Garden*, whereby both the Roots of his Plants, are kept the moister; and also, he doth Yearly gather a rich Mould, out of his Alleys, to amend and better his *Hop-Hills* withal. *Sir Hugh Plat, ubi supra.*

9. Of Salt Sowed at Clapham.

What should I speak of him, that of his own Mother-Wit, Sow'd a Bushel of Salt, long since, upon a small patch of Barly Ground, at *Clapham*, which, to this day, remains more fresh and green, all full of Swarth, than all the rest of the Field about it. *Sir Hugh Plat, ubi supra.*

10. Of brakish Sands used for Dung.

I must add, says my Author, the daily and useful Practice of the West parts of this Land, where the people (to their great Charge in Carriage) convey the Saltish Sands to their Barren Grounds, whereof some of them lie five Miles distant from the Sea, And yet they find the same exceeding profitable, for that their inheritance is enriched for many Years together. *Sir Hugh Plat, ubi supra.*

11. Of the Brine of Salt Pits.

It is a common *Experiment*, which has long time, in the view of many persons, been Yearly practiced in the Fields, near adjoining to the Salt pits at *Nantwich*; where, upon the fall of any great quantity of Land-water into their Pits, being forced to empty, and throw out all the fresh water, which always floateth upon the Brine, and to bestow the same in such places as are nearest, and therewith also emptying

emptying some of the Brine with the fresh Water; they find, in time, this Earth so strongly impregnated with these brackish Waters, that no Soyl or Dung is comparable to it for the Manuring of their Grounds. Sir Hugh Plat, *ubi supra*.

12. Of Soap Ashes.

Because, says my Author; I would be loth to leave the most Renowned City of *England* (wherein I was born) without some further and sweeter help for her barren Grounds, than she has hitherto been acquainted with; and for that I daily see a most rich Commodity trampled under foot, and condemned of all Men; I hold my self even bound in Conscience, for my Country's good, not to hide the same any longer, but rather to publish all such profitable Uses thereof, as I conceive my self, or have learnt of others.

The matter which I mean, is the waste *Soap-Ashes*, which our Soap-Boylers, for the most part, will give for the Carriage, and some of them do pay for the Carriage, when they are convey'd from their Houses. And here it may be no shame for us to acknowledge the *Flemmings* (who are generally accounted the most skilful and painful Husbandmen of all Europe) to be our first Teachers to the use of them: Nay, it is rather a great shame to us, that we cannot be provoked (tho for our own profit) to imitate their Example, who have so many Years enriched themselves thereby, and have, of late Years, been forced to leave them, to their great Loss.

As to their good Opinion (and profitable Use) of them, I think we need no further Argument to maintain it, than the price which they gave for them to the Soap-Boylers, which I have credibly heard was three Shillings, or ten Groats a Load; besides the Carriage of them into their own Country.

And yet if the infinite extension of them, the easie charge of bestowing of them, together with their especial Nature in suppressing of Weeds, be well weigh'd and consider'd, we shall find them to be much cheaper of that price, than any common Soyl, or Stable Dung whatsoever. For how cheap soever our other Soyl be, yet the transporting thereof from place to place (if the Land lie at any distance) doth make it so chargeable, that the poorer sort of Farmers, in many places of this Realm, will scarce afford the Carriage thereof to their Grounds, though they might have the same freely given them; whereas two Load of these Ashes, or three abouts, being sufficient for an Acre of Arable Ground, is soon bestow'd by the Labour of one Man, without the Help of any other Cart or Horse. For the manner about *Bruges* in *Flanders*,

Flanders, was, (after they had sown the same with Grain) to strow these Ashes thereon with their Hands, till the Ground seem white with it, and that was sufficient for that Year; and by this Practice they might Sow the Ground yearly; without leaving it Fallow at any time; yea, their Ground being helped in this manner, would yield them a most rich Crop of Flax, whose Seed, of all other, doth most burn and pill the Ground; for says the Poet, *Vrit enim lini Semen*.

And because I would not rely upon the Outlandish Experience of those Ashes, I thought good, says my Author, to prefix [which he doth in his Book] the Portraiture of an Ear of Summer Barly, which [together with sundry others of the same size, as by divers Eye-witnesses of good credit, I can prove and justifie] grew this Summer at *Bishops-Hall*, where I dwell, to the great admiration of the Beholders; the Stalk whereof, together with the Ear, was an Ell and three Inches in length, from the Ground to the Summit thereof. And this I did in a barren Ground, by the means of those Soap-Ashes, God blessing my Labours.

I have also this Year, found the like success thereof in Pasture Ground, by the means afore-said. And—

I know a well experienced Citizen of *London*, who has made often tryal of them upon his own *Artichokes*, and found them very successful, by applying them to their Roots in the Winter time. *Sir Hugh Plat, ubi supra*.

13. Of Pilchards.

I am credibly informed [and the reason thereof is so apparent, as that none, but such as deny the conclusion of a Syllogism, can deny it,] That after such time as the Coast-Men have by Expression [and other apt means] gotten that kind of *Train-Oyl*, which they call *Pilchard-Oyl*, from the Fish of that Name, that they do also bestow that which remains of the *Pilchards*, upon their lean and hungry Grounds, the Substance whereof, by putrifaction, doth, in time, become a most rich and fruitful Mould, and such that giveth heart to the Earth for many Years together. *Sir Hugh Plat, ubi supra*.

PARAGRAPH IV.

Experiments and Observations of the Propagation of Plants, by Off-sets, Layers, Stems, Cuttings, or Slips, &c.

I. Of a way of making Off-Sets by Art.

Nature usually provokes this help of Propagation, without the Wit or Industry of Man call'd to her assistance; but that not generally in all Plants, nor alway in any one: And therefore I esteem it well deserving any Man's Learning who delights in Gardens, to know any means to enlarge this way of Propagation beyond the Bounds it is carried to by Nature's Course.

There is a pretty way (which in truth I first learn'd from Mr. Robart our Physick-Gardener) for the making of *Off-sets* where Nature never intended them, which is done by baring the Root of Plants of woody Substance, and then making a cut of the same fashion with that which is commonly made in laying: Into this Cleft a Stone must be put, or something that will make the Root gape; then cover the Root over three Inches with Mould, and the Lip that is lifted up will sprout into Branches, the Root of the old Tree nourishing it. When the Branches are grown, cut off this Plant, with its Root to live of it self.

If you can, leave an Eye on the Lip of your Root, which you after the incision lift up; for the Branch will then more speedily and certainly issue out of the Root so cut.

In Bulbous Roots, *Ferrarius* makes *Off-sets* thus: If, says he, a Bulbous Root is barren of *Off-sets*; either put it in better Earth, or cut it upon the bottom, in the crown of the Root whence the Fibres spring, and that but lightly with your Nail, and sprinkle some dry Dust as a Medicine to the Wound; and the effect he affirms to be this, that so many Wounds as you make, into so many *Off-sets* shall the genital Vertue dispose it self. *Mr. Sharrock's History of the Propagation and Improvement of Vegetables.*

2. *Of Planting and ordering of Hops.*

The *Hop* being one of the most useful Plants that are propagated by *Suckers* or *Off-sets*; I shall, in treating of the Culture of it, saith my Author, give my Planter such instructions for the whole management of this noble *Vegetable*, as I have learned from the *Observations* of Planters that have made, I speak within compass, two hundred Pounds in a Year of an Acre of Hop Ground, cultivated with the expence of ten Pounds per Acre, as themselves have related it to me: I mean my *Hop Masters* at *Farnham* in *Surrey*, and thereabouts. But yet I intend not to derogate from the Instructions and Directions given by Mr. *Blith*; but where just Reason, and the practice of such places where such *Observations* have been made, shall necessitate me so to do.

Mr. *Blith* directs not amiss, when he orders thus——In *March*, if you have not pull'd down your Hills, you should with your Hoe, as it were, undermine them round till you come to the principal Root, and taking the upper or younger Roots in your Hand, and discerning where the new Roots grow out of the old Sets, of which be careful, but spare not the other; but in the first Year uncover no more but the top of the old Sets, but cut no Roots before the end of *March*, or beginning of *April*. The first Year of Dressing, you must cut off all such as grew the Year before within an Inch of the same; and every Year after cut them as close to the old Roots; those that grow downwards are to be cut, 'tis those that grow outward which will incumber your Garden; the difference between old and new easily appears; you will find your old Sets not increased in length, but a little in bigness, and in few Years all your Sets will be grown into one; and by the colour also, the main Root being Red, the other White; but if this be not early done, then they will not be perceiv'd: And if your Sets be small, and placed in good Ground, and the Hill well maintained, the new Roots will be greater than the old; if they grow to wild *Hops*, the Stalks will wax Red; pluck them up, and plant new in their places.

At *Farnham* they generally begin to pole their *Hops* about the latter end of *March*, sometimes sooner, sometimes later, according to the forwardness, or backwardness of the Spring. In Hilling and Poling, this Rule is generally observed, That if the centre, or middle of your Hills be five Foot asunder, then three Poles will suffice each Hill, otherwise if they stand nearer, two Poles may be sufficient. In some places they Pole them before they make their Hills, and, in some places after: At *Farnham* they make their Hills commonly when they cut and cleanse the *Hop-Roots* from the *Suckers*,

Suckers, namely, at the beginning of *March*, and Pole them in an ordinary Spring about the latter end of the same Month: But Mr. *Blith's* Directions are to make the Hills after they are Pol'd, and ty'd to their Poles: When, says he, your *Hops* are grown two Foot high, bind up with a Rush, or Grass such of your Springs to the Poles as do not of themselves, winding them as oft about the Poles as you can, and wind them according to the course of the Sun, but not when the Dew is upon them; your Rushes lying in the Sun will toughen, says he, but surely better in the Shade.

And now you must begin to make your Hills, and for that purpose get a strong Hoe, of a good broad Bit, and Cut, or Hoe all the Grass in the Alleys between your Hills, and therewith make your Hills with a little of your Mould with them, but not with strong Weeds; and the more your Hills are raised, says he, the better, the larger, and the stronger grows your Root, and bigger will be your Fruit. But this Rule is not subscribed to at *Farnham*, where they esteem their Gardens best ordered, where the Hills are made bigger, or less in proportion to the strength and bigness of the *Hop-Root*.

And whereas Mr. *Blith* orders, That from the time of the making of the Hills, the Gardener should be ever and anon raising his Hills, and clearing his Ground from Weeds, until the time of gathering; the *Observance* at *Farnham*, and divers other places, is only this; That in the beginning of *August*, or latter end of *July*, about the time that the *Hops* begin to Hoe, after a good Rain, they rake up Earth from the Spaces, and renew the Hills again.

In the first Year suppress not one Cion, but suffer them all to climb up the Poles; for should you bury the Springs of any of your Root, it would die; so that the more Poles are required to nourish the Spring.

But after the first Year, says Mr. *Blith*, you must not suffer above two or three; others say, not above four or five Stalks to go to one Pole, but pull down and bury all the rest. Yet you may let them grow four or five Foot long, and then chuse out the best for use. As soon as your Pole is set, you may make a circle how broad your Hill shall be, and then hollow it that it may receive the moisture, and not long after proceed to the building of your Hills. What he adds, that where your *Hops* are highest, there you must begin again, and pare again, and be always paring up, and laying it to the Hills, and that till the Hill comes to be near a Yard high, is contrary to the practice both at *Farnham*, and other places; for the highest Hills they make, are but half a Yard, or two Foot high at the most; neither do they tye themselves to such continual attendance in paring and adding to the Hills.

It is a question, whether [if the Hop attain not to the top of the Pole, by the midst of *July*] it be not good advice to break off the top of the same Hop, that the rest of the time may serve to nourish the Branches, which otherwise would lose all, the running up being no advantage to the Stock, or Increase of the Hop. Mr. *Blith* holds the affirmative part; but others there are that do assert the Negative, and alledge for their Reason, that they find by Experience, that the beating off the tops in this manner, makes the *Hops* bleed, and is very prejudicial to them.

At *Farnham* also, [which is accounted as good a Soyl for *Hops*, and as secure from Blights as any in *England*;] I find their Gardens planted, not upon moist and boggy Ground, but upon a marly loamy mixt Ground, upon the declivity of their Heaths, and the Soyl they use is thoroughly rotten; for they have an Observation, that if the Dung which they imploy about their Hills be new and fresh, it certainly breeds the Blight.

For the drying of their *Hops*, they do, as soon as they are gathered, put them on a Kiln; some use the same Kilns which they use for the drying of Malt; upon which, tho' they lay them near a quarter of a foot thick, they will be dry'd in twelve Hours. They must be dry'd without Smoak, and therefore they generally dry them with Charcoal. But some under their Kiln have an Iron Furnace about two foot square, with a close Grate, into which they put Sea-Coal, and with a vent, or conveyance for the Smoak; which Iron-Furnace being kept glowing hot with the Sea-Coal, gives heat enough for the Kiln, nor doth the Smoak of the Sea-Coal annoy the *Hops* because it is kept in.

Others [in the Neighbouring Villages] dry their *Hops* with Wood that is light and dry; but in other Countries with Wheat Straw; for generally they dry their *Hops* with the same Fuel that they dry their Malt, and use the same Diligence that they be not prejudiced by the Smoak. Mr. *Sharrock*, *ibid.*

3. Of the time of Planting Hops.

Authors, and most Practisers, usually advise to plant *Hops* in the end of *March* or *April*; but some of our best experienced Planters affirm it to be best done in *October*, before the cold Winter; and that then the *Hops* will settle against the Spring. Mr. *Worlidge's Systema Agriculturae*.

PARAGRAPH V.

Experiments and Observations of the Raising, Planting, and Propagating of Trees and Shrubs.

1. Of Planting Fruit-Trees.

For Orchards, is a very necessary Requisite, that the Roots of *Fruit-Trees* stand above the Gravel, Clay, or Rock, if any such be; Provision for which I have known made two ways; the usual and most common is, to plant with such Standards as have no down right Roots, which may be gotten in any well ordered Nurseries; for in such the seedling Plants are taken up the second Year, and the down right Roots being taken off short, they are set in Beds for Grafting, and by this means shoot their Roots rather in compass than directly downward. The second way is a more unusual Experiment, viz. To set the *Fruit-Tree* on the top of the Ground, without any hole dig'd, and to lay a load of such Dirt as is found in the Streets to the Root, upon the Turf; yet so, as the Rain may abide, and not [by reason of the Bank] run from the Root of the new set *Fruit-Tree*. *Mr. Sharrock's History of the Propagation and Improvement of Vegetables.*

2. Another of the same.

There is a pretty way of planting of *Fruit-Trees*, set down by Esq; *Evelyn*, which is thus; Set, says he, your Tree on the green Swarth, or five or six Inches under it, if the Soyl be very healthy; if moist or weeping, half a Foot above it; then cut a Trench round the Tree, two Foot or more from it: Lay a rank of the Turfs [with the Grass outwards] upon the inner side of the Trench towards your Tree, and then a second rank upon the former, and so a third and fourth, all orderly placed [as in a Fortification] and leaning towards the Tree, after the form of a Pyramid, or large Hop-Hill: And always as you place a row of Turfs in compass, you must fill up the space within the Circle with the loose Earth of the second Spit which you dig out of your Trench, and so raise your Hillock near a Yard high; at the top it need not be above two Foot or eighteen Inches in Diameter, where you may leave the Earth in the form

of a Dish, to convey the Rain towards the Body of the Tree ; and upon the top of the Hillock prick in five or six Bryars or Thorns, binding them lightly to the Body of the Tree.

The Commodities of this kind of Planting are,

1st. Neither Swine, nor Sheep, nor any sort of Cattle can annoy your Trees.

2^{dly}. Thus you may set the smallest Plants out of the reach of Cattle.

3^{dly}. Thus your Trees fasten in the Hillock, against the violence of Winds, without Stakes to fret and canker them.

4^{thly}. If the Soyl be wet, it is hereby made healthy.

5^{thly}. If very dry, the Hillocks defends from the outward Heat.

6^{thly}. It prevents the Couch-Grass, which for the first Years insensibly robs most Plants in sandy Grounds apt to graze. And,

Lastly, The grazing Land will recompence the niggardly Farmer for the waste of his Ditch, which otherwise he will sorely bethink. *Pomona. Cap. 7.*

Mr. Sharrock mentioning this way of planting Trees, saith, *I have known* in a dry Year, when Trees thus Planted grew and shot well, when others Planted the ordinary way, all perished with the dryness of the Weather. Sharrock *ubi supra.*

3. Of Planting Elms.

I have been very credibly inform'd, That a certain Gentleman in the North Country, having a desire to raise suddenly a Plump or Grove of Trees about his Mansion House, (there being a great scarcity of Wood in that place) he obtain'd a parcel of *Elm-Trees*, Lops and Tops, and made Trenches, or Ditches in the Earth, and cut his *Elm-Branches*, &c. into several lengths of 6, 8, 10, or 20 Feet in length, as with best conveniency he could, and buried them singly in the Trenches so digged, and cover'd them wholly from one end to the other, leaving only a hole open about the middle of the interred Branch; or if it were a long piece, then two open places might be left, out of which places did spring forth several shoots (the first Year) of a very great length; the Winter succeeding, he took those Branches or Shoots, all, save only the fairest, and which was most probable and likely to thrive, and so filled up the hole about it, by which means they grew to a prodigious height in a few Years, that his Habitation was compleatly adorned with living aspiring Products of his ingenious attempts.

Note,

Note, That the true time of this Sepulture is when the Sap is full in the Tree, when the Leaves are newly sprung; for then the great quantity of Sap that is in the whole Branch, forceth it self into those Shoots, or Cyons that then have found a passage; also for the succeeding Years, the whole Tree in the Earth becomes a main principle nourishing Root, to the nimble growing Tree. For it is evident, that if an Elm be felled in the Spring time, when the Sap is up, that the Tree lying on the Ground, will spend much of its Sap in small Shoots in every part of it. Much rather, if such a Tree were buried in a good moist Soyl, with only one part of it open to the Air, from which part you expect a flourishing shoot to proceed. Some have (with good success) buried such Elm Branches about the end of January, or beginning of March; but if the Land, be not over dry, the latter is better. *Mr. Worlidge's Systema Agricultura.*

4. Of Planting Ashes.

There is no Tree delights more, nor is more beneficial in the Chalk, or white Land than the Ash; for on those white Hills in *Wiltshire, Hampshire, &c.* that Tree thrives exceeding well, and being sown in the Keys there, would in time, prove a very considerable advantage, as well to the, private as publick.

It is propagated from the Seed or Keys, which being gathered in *October*, or after, when they begin to fall, and sown in your Nursery, the next Spring come twelve Month, they will appear, and will afterwards thrive and prosper very well: They are to be removed whilst they are small, because of their speedy deep Rooting. Take not off the tops of the small young Ash, because it is a sappy Plant; but of the greater Sets, its best to cut them near the Ground, and then they will send forth new shoots which will soon supply the defect of the other, which may also be done in all young Ash after they are settled, and it will cause to shoot large and thriving shoots: *I have seen the Experiment of it in such Plants that stood several Years, and every Year decay'd, till cut off at the Roots, and then they did wonderfully thrive.* *Mr. Worlidge, ibid.*

5. Another of Planting Fruit-Trees.

Where the Ground is shallow, or lies near Gravel, Clay, Stone, or Chalk, or near the Water, take the top of one half of the same Land, and lay it on the other in Ridges, abating the intervals like unto Walks, and plant the Trees on the midst of the Ridges, by which means they will have
double

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double the quantity of Earth to Root in that they had before, and the Walks or Intervals preserve the Ridges from superfluous moisture. *It has been found an approved Remedy in dry shallow Land, as well as in low wet Land.*

It has (also) been observed, That Pear-Trees will thrive and prosper in cold, moist, hungry, stoney and gravelly Land, where Apples will not bear so well. Mr. Worlidge, ibid.

6. *Of Planting Aquaticks, as Poplar, Withy, &c.*

Planters in most places do *strictly observe* to cut the Foot or Ground-End [of Poplar, Withy (or other Aquatick Pitchers, or Sets) only one way, like a Hinds Foot, pretending that to be a principal Observation. Mr. Workidge, *ibid.*

7. *Of Planting Box.*

Strip away the Leaves from the Boxen slip, and wind not the Stem, but set it whole without winding, and it will grow; proved by T. T. Sir Hugh Plat's Garden of Eden. *Experiment 4. of Trees and Plants.*

8. *Of Planting Bays.*

Every slip of a Bay-Tree will grow; strip off the great Leaves, and set them in March, when the Sap begins to rise, Sir Hugh Plat, *ibid. Experiment 5.*

9. *Of Planting Elders.*

Every Plant of an Elder will grow; proved by T. T. Sir Hugh Plat, *ibid. Experiment 6.*

10. *Of Planting Poplars.*

Every slip of the Poplar-Tree will grow. Sir Hugh Plat, *ibid. Experiment 8.*

11. *Of the time when to Plant Cherries.*

Plant Cherries in October, November, January, and February. Sir Hugh Plat, *ibid. Experiment 10. from T. T.*

12. *Of the time when to Plant Quince.*

Plant Quince-Trees in October, November, February and March. Sir Hugh Plat, *ibid.* Experiment 11. from T. T.

13. *Of the time when to Plant Hazels and Pear-Trees.*

Set Hazels and Pear-Trees in October, November, February, and March. Sir Hugh Plat, *ibid.* Experiment 12. from T. T.

14. *Of Setting Apple Kernels.*

Set Apple-Kernels the end that is next the Root downwards, five Fingers breadth betwixt each Kernel; moisten them often with Water, by sprinkling; and set them in March. Sir Hugh Plat, *ibid.* Experiment 13. from T. T.

15. *Of Setting Plumb Stones.*

Set Plumb Stones in November, six, or eight Inches deep in the Earth. Sir Hugh Plat, *ibid.* Experiment 14. from T. T.

16. *Of Setting Peach-Stones.*

Set Peach Stones the sharp end downward, in November, four or five Inches deep. Sir Hugh Plat, *ibid.* Experiment 16. from T. T.

17. *Of Planting Filberts and Quinces.*

The Suckers (or young Shoots coming out from the Root) of Quince-Trees and Filberts, will prove well, being planted. Sir Hugh Plat, *ibid.* Experiment 39. from Taverner.

PARAGRAPH VI.

*Experiments and Observations of Watering Land, Herbs, Trees and Shrubs.*I. *Of Watering Meadows.*

There is a considerable improvement of dry, sandy, and gravelly Earth, by the fatty Soil and wash that is carried both in Land Floods, and other Waters, that having passed through Cities, Roads, or other places of like Nature, are drawn over the Ground; for the Salt, Oily parts, and other mist Earth that was carried in the Flood, is generally left behind upon the Land; and the Salt diluted in the Water, easily enters the Turf, and carries with it other Particles thither, where, by the heat of the Sun (they being in conjunction with the Sand, Gravel, or other Bodies heterogeneous, and unlike to themselves) they cause, by their mutual fermentation (as is supposed) or some other way, that temper of Ground which is most fit for the growth of all Grain, Grasses, and other Vegetables of general use.

Nor are Land Floods the only watering; for Springs that arise from any improving Minerals, carry with their Water many improving Particles: *I remember particularly, that I was informed, by an excellent Person, and practised Waterer, that he had observed, in some Lands of his own, That this Improvement made by floating with the Water, that came immediately from Chalk Springs, was very considerable to him, nor much inferior to Land Floods.*

For drawing the Water over Land, discovery must first be made (by the Eye, or by the Level) where the Water may be convey'd over the moist Land: Then Mr. *Blish* advises, to cut out the master-Trench; or Water-Course, to such a bigness as may contain all the Land-Flood, or, at least, be able to bring it within the Land intended for this Improvement: When the Water is brought thither, carry it along in a Foot broad Trench, or lesser, all along the Level: If the Level be too dead, the lesser Stream will follow; so that a convenient descent must be minded, to give the Water a fair passage. If there be discovered in the lesser Trench, any mistake or falling, it may with ease be amended, by going higher to, or lower from the Level, and the first Trench be stopped up again; for this Trench
need

need be no deeper than the thickness of the upper Turf, This done, the Water-Course must be cut out, which must be large enough to contain the whole Water which is intended for the enrichment of the Land; which largeness ought to consist in breadth, and not in depth; for a shallow Trench, about a Foot deep, is best for this Work: When the Trench is brought near to the end of the Land, it is to be drawn narrower and narrower.

Further Directions Mr. *Blith* gives (in his *English Improver*) in these words.

“As soon, says he, as thou hast brought the Water upon the Land, and turn’d it over, or upon it, be sure that thou take it off as speedily as possible, and so fail not to cut thy Work; so as that unless thy Land be very sound, and thy Land-Flood very rich, thou must take it off the sooner by a deep draining Trench. Therefore I prescribe no certain breadth, betwixt floating and draining Trenches; but if the Land be sounder and dryer, or lieth more descending, thou maist let it run the broader; and as the Land is moist, sad, rushy, or level, let it run the lesser breadth or compass; and for the draining Trench, it must be made so deep that it go to the bottom of the cold, spewing, moist Water, that feeds the Flag and Rush; for the wideness of it, use thy own liberty, but be sure to make it so wide, as thou maiest go to the bottom of it, which must be so low, as any lies under the upper and second Swarth of the Earth, in some Gravel or Sand, or else, where some greater Stones are mixed with Clay, under which thou must go half a Spades Graft deep at least: Yea, suppose the Corruption that feeds and nourishes the Rush or Flag, should be a Yard or four Foot deep, to the bottom of it thou must go, if ever thou wilt drain it to the purpose, or make the utmost advantage of either Floating or Draining, without which thy Water cannot have its kindly Operation. The truth is, otherwise the Benefit might happen to be no greater than the Patients, who incur’d a Dropsy in his Cure from a Feaver: Whereas, by this means, there is a double Benefit, the first whereof comes by the Commodity of Watering, the second by the draining Trenches necessarily annexed thereunto.

But whereas the aforesaid Author commends Watering or Floating, as a help to boggy, rushy, quagmiery Land, I suppose no Benefit (but rather Hurt) would arise thereby to such Lands, if these draining Trenches did not open the Passages of the obstructed Springs, original Causes of the Bog or Rushiness, as well as let out the Water newly introduced by the Floating.

The time of the operation for this Improvement, must be when the Grass is all off the Ground, for else the Soyl will stain it that comes along with the Flood: Often watering

is good, but to keep it long in a place breeds the Rust.

For this Operation therefore, these are special Rules, To begin your work betimes in the Year; as soon as the Grass has done growing, and is eaten off; That the Stream or Flood that runs over the Grass be as shallow as possible, and the Water continue its running; it must be no deeper than the short Grass which must strein the Water as it floats, for else the hungry Water may lie still at the Roots of the Grass, and the fat run over it; likewise it is to be provided, that by reason of the unevenness of the Ground, the Water stand not, nor restagnate as in a Pool on any part of the Ground, for the same Reason, because the Land-Flood then would pass along upon a level of restagnant Water, and would not touch the Turf or Grass, which ought to entertain, stay, and arrest the Richness and Fat of it.

By this very Husbandry, Mr. *Blith* brings precedents of Improvement of Land, from eighteen Pence to thirty Shillings an Acre; and Mr. *Plat* from one Shilling to five Pound. Mr. *Sharrock's History of the Propagation and Improvement of Vegetables*.

2. Of Watering Kitchen-Plants.

Tho' Kitchen-Plants are best improved by watering them with Fat Water, such as is usually gathered into Ponds after a Land-Flood, or from the washing of a Dung-Hill; yet, herein you ought to be careful that it be not too foul; for then it will breed Flies and other Vermin, which will endanger the health of the Plants; as appears by this Experiment of *Magnenus*.

Anno 1645. *Æstate sicciori* (says he) *Feniculum & aliæ Plantas irrigari Jusseram. Aqua sumpta est ex Puteo fetenti. Ne ramus quidem fuit in Feniculo, ne grannlum unum quod Vermiculis non scateret. Idem Absynthio contigit, & nisi advertissem Tobacco adnatæ erant exiguæ Muscæ capite nigro, Ventre virescente, quæ Plantæ morbum induxerant, sed mutata irrigatione rediit sua puritas herba.* Which may be thus Englished.

In the Year 1645, the Summer being very dry, I ordered *Fennel*, and other Plants to be watered; the Water was drawn out of a stinking Well; there was no Branch nor Leaf in the *Fennel* that was not covered with Worms. The same happened to *Wormwood*, and unless I had taken notice to prevent it, there were little Flies with black Heads, and green Bellies that cover'd the *Tobacco*, and had diseased it, but changing the Water, the Plant recover'd its former Purity. *Magnenus Exercit. 1. De Tobacco & Manna* 3. Of

3. Of Watering Hops.

A dry Spring, such as happened in the Years 1672, and 1674, proves a great check to *Hops* (in their first springing) especially in hot and dry Grounds. In such Years it is very advantageous to water them, if it can with convenience be obtained, either from some Rivulet or Stream running through, or near your Garden, or from some Well digged there, or out of some Pond made with Clay, in the lower part of your Ground, to receive hasty Showers by small Aqueducts leading to it, which is the best Water of all for this purpose.

In the midst of every Hill make a hollow place, and thrust some pointed Stick or Iron down in the middle thereof, and pour in your Water by degrees, till you think the Hill is well soaked; then cover the Hill with the parings of your Garden, which will set the Hop mainly forward, *as I have known*; which otherwise would be small and weak, and hardly ever recover to attain its usual height. Also a very hot and dry Summer will make the Hop blow but small and thin; therefore it would not be labour lost to bestow a pail of Water on every Hill prepared before-hand to receive it. *Mr. Worlidge's Systema Agriculturae.*

4. Of Watering any choice Plant, thick about the end, and always moist about it.

If you are willing to have the Ground always moist about any Plant, place near it a Vessel of Water, putting therein a piece of Woolen Cloth or Lift, and let one end thereof hang out of the Vessel to the Ground, the other end in the Water; let the Lift or Cloath be first wet, and by this means the Water will continually drop till all be dropped out of the Vessel, which may then be renewed. The end which hangs out of the Vessel, must be always lower than the Surface of the Water within the Vessel, else it will not succeed: If it drop not fast enough, encrease the Lift or Cloth; if too fast, diminish it. *Mr. Worlidge, ibid.* This is but the Chymists Experiment of Filtration apply'd to *Ter-raculture.*

PARAGRAPH VII.

*Experiments and Observations of re-
newing, or transplanting of Herbs,
Trees and Shrubs.*1. *Of the Season for transplanting of most
Trees and Shrubs.*

AL L *Trees and Shrubs* of woody Substance, that have Bodies able to endure the Cold, are best *transplanted* before the Winter, as soon as the Leaves begin to fall, by reason of the approach of the Hybernal Cold. It is lately experienced, that a *Quickset* of *White Thorn*, or any other sorts, *Apple-Trees*, or other Orchard Trees, being planted before the Winter, far out-grow others of the same Kinds, that are planted in the Spring. *Mr. Sharrock's History of the Propagation and Improvement of Vegetables.*

2. *Of Removing or Transplanting Trees.*

Divers persons are very nice in the placing of any Tree in the same respect to the Heavens, I mean to the Sun and Winds, that after the removal of it to another place, it may have the same Situation it first grew in. This Rule Sir *Kenelm Digby* approves of, and gives these Reasons of its necessity. There is (says he) a constant perpetual Course of Atoms drawn by the Sun from the Poles towards the *Æquator*, and such things as lie in their Channel, must necessarily be affected with their continually repeated strokes; and that side of them which is exposed to their immediate Blows, must be most sensible of them; on the other side, the Sun, with his warm and moist regiment of Atoms, will work contrariwise, one side of the Plant will be close, hard and heavy, and be rather acute then perfectly round; the other will be spongy, tender, light, and dilated, having its Figure enlarged beyond roundness; so that, says he, if you expose the tender mellow South-side of the Tree, to the sharp, hard wedges of the Northern-Air, they will so cleave and batter it, that in a short time it will ex-
hale

hale its Spirits and die. The truth is, That if the Phenomenon were true, that those that kept Nurseries, and transplanted five thousand in a Year without any Observation of the North and South, did find their Trees die thereupon, I should think the Cause satisfactorily explained. But they finding no such effect (perchance, because their Grounds are under the Wind) I must leave every body to their liberty to observe or neglect this Rule. *Mr. Sharrock; ibid*

3. Of removing young Oaks.

In removing and transplanting young Oaks, you must be sure not to cut off, or wound that part of the Root which descends down right (which in some Countries they call the top-Root) but dig it up to the bottom, and prepare your hole deep enough to set it: Else, if you persuade it to live, you hinder the growth of it half in half. (This Observation my Author received from his honoured Friend *Walter Burrell Esq; of Cuckfield in Sussex.*) *Mr. Ray's Connection of English Words.*

4. Another of removing or transplanting Trees.

Trees will not prosper well, if removed out of a warm shelter, into an open bleak Air; being sensible of so great a Change. *I have known* Trees decay that have not been removed, only other Trees (that sheltered them from the cold) taken away. *Mr. Worlidge's Systema Agriculturae.*

5. Of removing Trees in Summer.

If either your impatient Fancy, or your urgent Occasions oblige you to the Removal or Transplantation of Trees in the Summer, you may tread in the steps of a certain *Prince Elector*, that at *Heydelberg*, in the midst of Summer, removed very great *Lime-Trees* out of one of his Forests, to a steep Hill, exceedingly exposed to the heat of the Sun, the Heads being cut off, and the Pits into which they were transplanted, filled with a composition of Earth and Cow-Dung, which was exceedingly beaten and so diluted with Water, as it became almost a Liquid Pap, wherein he plunged the Roots, covering the Surface with the Turf; it is presumed, that if the Trees were smaller (be they of that Wood soever) there needeth not so absolute a Depreciation. *Mr. Worlidge, ibid.*

6. *Of removing and transplanting of great Trees.*

Several Relations there are of Trees that have been transplanted or removed, of eighty Years growth, and fifty Foot high to the nearest Bough, waisted upon *Floats* and *Engines* four long Miles with admirable success, and of *Oaks* planted as big as twelve Oxen could draw; to which effect these are prescribed, as the ways to accomplish the like Design.

Chuse a Tree as big as your Thigh, remove the Earth from about him, and cut through all the colateral Roots, till with a competent strength you can inforce him upon one side, so as to come with your Ax at the Tap-Root, cut that off; redress your Tree, and so let it stand (covered about with the Mould you loosen'd from it) till the next Year, or longer, if you think good; then take it up at a fit Season.

Or a little before the hard Frost surprize you, make a square Trench about your Tree, at such a distance from the Stem, as you should judge sufficient for the Root; dig this of competent depth, so as almost quite to undermine it; by placing Blocks and quarters of Wood to sustain the Earth; this done, cast on it as much Water as may sufficiently wet it, unless the Ground were moist before; thus let it stand till some very hard Frost do bind it firmly to the Roots, and then convey it to the Pit prepar'd for its new Station.

But if it be over ponderous, you may raise it with a Pulley between a Triangle, placing the Cords under the Roots of the Tree; set it on a *Trundle*, or *Sled*, to be convey'd and Re-planted where you please: By these means you may transplant Trees of a large Stature, and many times without toping, or diminution of the Head, which is of great importance to supply a *Defect*, and remove a *Ciriosity*. Mr. Worlidge, *ibid*.

7. *Of removing or transplanting of Fruit-Trees*

In removing *Fruit-Trees*, Plant them not too deep, for the over-Turf is always richer than the next Mould: And in such places where the Land is Clayish, over Moist, or Spewy plant as near the Surface as you can, or above, and raise the Earth about the Tree, rather than set the Tree in the Wet, or Clay. The same Rule observe in Gravelly, or Chalky Land; for the Roots will seek their way downwards, but rarely upwards: I have known Trees planted too deep, pin away, and come to nothing. This Rule observed, many places

places may be made fruitful Orchards, that now are judged impossible, or not worth ones while. Mr. Worlidge, *ibid.*

8. *Another of removing, or transplanting of Trees.*

Trees that bear early, or often in the Year (as *Pear-Trees* upon *Windsor-Hill*, which bear three times in a Year) these, tho' they be removed to a rich, or richer Ground, yet they do seldom bear so early, or so often, except the Soyl be of the same hot Nature, and have the like advantages of Situation, and other Circumstances, with those of *Windsor*. And therefore, commonly the second Fruit of that *Pear-Tree* being removed, doth seldom ripen in other places *Sir Hugh Plat's Garden of Eden. Experiment 96. from Mr. Hill.*

9. *Another of removing, or transplanting of old Trees.*

The Lord *Zouch*, in the Winter, in the Year 1597. (And Mr. *Hill* thinks moist Weather is best, that the Earth cleaving to the Roots, may be also removed with them, the Earth being fast bound with *Fern-Branched* to the Roots;) removed divers *Apple-Trees*, &c. being of thirty or forty Years growth, at *Hackney*: The Earth was digged in a good large compass from the Roots, and the Roots little hurt; Holes were prepared for each Tree before hand, enriched with fresh and good Earth; the Branches and Tops taken off almost close to the Trunk; and they were planted again in the same Hour wherein they were removed; and the Roots placed towards the same point of the Compass as they first grew. He had a few *Damsons* the first Year, and all put forth Leaves at *Michaelmas* after, Anno 1598. *Garden of Eden, Experiment 106.*

10. *Of removing Herbs and Flowers in the Summer.*

If you remove any Rooted Plants, or Herb, or Flower, tho' it be somewhat forward in the Summer (so as you do it in the Evening, after the heat is past, and plant it presently and water it) there is no danger of the parching heat of the Sun the next day: But before heave up the Earth carefully, so as you do not break the least Sprigg of any Root; for then the Sap goes out of the Plant, and it perishest. This way you may remove great *Gilliflower* Roots,

PARAGRAPH VIII.

Experiments and Observations of Cutting, Pruning, or Lopping of Trees, &c.

1. Of Lopping of Elms.

FOR Lopping of great Boughs, I may, says my Author, here add an *Observation* touching *Elms*, which is, That if the top of an *Elm* of any bigness be cut off, the Root will immediately begin there, and by wet, and other accidents, run downward, and cause that hollowness which is ordinarily seen in Trees of this kind. *Mr. Sharrocks History of the Propagation and Improvement of Vegetables.*

2. Of Pruning Fruit-Trees, &c.

'Tis a good Rule in Pruning *Fruit-Trees*, that the Gardner never cut off those Boughs which are set and adapted for bearing, which is easily known; for *Roses* particularly, and *Rasps*, and *Vines*, always bear upon a fresh Sprout, shot forth the same Spring: so that the more you prune a *Rose*, *Rasp*, or *Vine*, the more fresh Sprouts of that Springs growth are emitted, and the more such Sprouts, the greater number of *Roses*, *Rasps*, and *Grapes* succeed, unless some particular accident destroy them.

Many Fruits bear from the Antecedent Spring, as the generallity of *Apples*, *Pears*, *Peaches*, *Nectarins*, and *Apricots*: Many seem to grow from Wood of a longer growth; but in that a Man may be easily mistaken, because a very little Spring (of a scarce discernable growth) may be enough to serve as a Foundation to the Pedal of the Blossom or Fruit, which standing on the old Wood, it may be thought, that the Pedal, or Stalk of the Fruit stands immediately on the Wood, and that there was no Spring interceding.

Some-

Sometimes the Blossoms of the same Tree, stand both on the Wood of the present and antecedent Spring, as is frequently seen in *Kentish-Codlings*, *Nurse-Gardens*, and great-bearing *Cherries*. But where-ever the Blossoms are, and there are many Buds fitted and prepared for bearing, they are easily discerned by the skilful Gardener, and may be seen by any body, for those are more full in their shooting up than other Buds are, and stand not so close made to the Stem of the Branch whereon they grow, and contain more small Leaves in their Body than other Buds, being, as I apprehend, the actual Rudiment of the ensuing Blossom: Such Boughs therefore, where on plenty of these full-made-Buds, or inchoate Blossoms are seen, the Gardener spares (if he is wise) for the present Year, and (where he may) prunes off such whereon he sees no such propension to Fruitfulness. Sharrock, *ibid.*

3. Of Pruning Timber-Trees.

It's best to Prune such Trees as are for Timber, whilst they are young, and the Branches not too big; of these and other Trees, it's good to cut off the Branches that are superfluous, about *January*, with a sharp Bill or other Tool, making the stroak upwards by reason of the Grain of the Wood, and to prevent the flitting of the Tree, at the fall of the Branch; and cut it clean, smooth and close: For by cutting off the Branches at a distance from the Tree, the Stumps are observed to Rot, and leave hollow holes, which decay the Tree, and spoil the Timber. Mr. Worlidge's *Systema Agriculturae*.

4. Of the Pruning of Fruit-Trees, especially Wall-Trees.

In Pruning *Fruit-Trees*, especially *Wall-Trees*, besure to leave the small Twigs that are shot and knitted to Blossom the succeeding Year; for you may observe, That most *Appricots*, *Peaches*, *Plums*, *Cherries*, &c. hang on those Sprigs, being usually of two Years growth: These are therefore to be carefully nourished, and not cut off, as is usual, to Beautifie the Tree. By this very *Observation* your Walls shall be full of Fruit, when your Neighbours have but few.

In *Wall-Fruit* cut off all gross Shoots, however fair they seem to the Eye, that will not without much bending, be well placed to the Wall; for if any Branch happen to be wreathed, or bruised in the bending, or turning (which you may not easily perceive) altho' it doth grow and prosper

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for the present, yet it will decay in time, the Sap, or Gum will also spew out in that place.

By neglecting of this *Observation*, many seeming fair Trees decay in several parts, when the Husbandman is ignorant of the Cause. *Mr. Worlidge, ibid.*

5. *Of Pruning Vines.*

In Pruning *Vines*, leave some new Branches every Year, and take away (if too many) some of the old; which much advantages the Tree, and increaseth the Fruit. And—

When you cut your *Vine*, leave two Knots, and cut at the next Interval; for usually the two Buds yield a bunch of Grapes. *I have observed Vines thus Pruned*, to bear many fair Bunches, whereas when cut close, as usually is done for *Beauty's sake*, which in the Husbandman is not in this case to be regarded) the Tree has been almost barren of Fruit, *Mr. Worlidge, ibid.*

6. *Another of Lopping Elms.*

When you Lop the *Elm* (which may be about *January* for the Fire, and more frequently, if you desire to have them tall; or that you would form them into Hedges; for so they may be kept fast and thickned to the highest Twig, affording both a magnificent and august Defence against the Winds and Sun;) I say, when you thus trim them, be careful to indulge the Tops; for they protect the body of the Trees from the wet, which always invades those parts first, and will, in time, perish them to the very Heart; so as *Elms* beginning thus to decay, are not long prosperous. *Sir Hugh Plat* relates (as from an expert Carpenter) that the Boughs and Branches of an *Elm* should be left a foot long next the Trunk when they are Lopt; *But this is to my certain Observation* a very great mistake either in the Relator or Author: For *I have noted* many *Elms* so disbranched, that the remaining Stubs grew immediately hollow, and were as so many Conduits, or Pipes, to hold, and convey the Rain to the very Body and Heart of the Tree. *Mr. Evelyn's Sylva.*

7. *Of Cutting Roses, Hedges and Arbours.*

Cut your *Roses* after they have done bearing (so soon as the Moon will give you leave, viz, the fourth, fifth, or sixth Days after the Change) and so you shall have store of *Roses* again about *Michaelmas*, or after. But, take heed you cut no Branch of a *Rose* so low, as that you leave no leading Branches upon it; for that will hinder the bearing of the *Roses* exceedingly.

It is also good in the aforesaid Days after the Change, to cut any *Hedge, Arbour, &c.* to make it grow the better; proved by Mr. S. Sir Hugh Plat's *Garden of Eden, Experiment 73.*

8. Another of cutting of Roses.

If you cut your *Roses* when they are ready to bud (in an apt time of the Moon) they will begin to bud, when other *Roses* have done bearing: This is an excellent secret, if Frosts happen in budding time; for so you may have store of *Roses*, when others shall have few, or none, and may then be sold at a high rate. *This I proved* (the eighteenth of March 1606. being a few days after the Change) upon divers Standards at *Bednal-Green*, being extreemly nipped with Frosts in budding time, and many of them did yield me great store of *Roses*, when the rest of my Garden did in a manner fail. *Sir Hugh Plat, ibid. Experiment 85.*

9. Another of the same.

Cut your *Rose Standards* in the Twelve days and not before; so they will bear exceeding well: Proved often by *Garret the Apothecary*, and *Pigot the Gardener*. *Sir Hugh Plat, ibid. Experiment 86.*

10. Of Lopping Trees.

Lop the Branches of your Trees alway in the Winter (before the Sun riseth) within ten or twelves Inches of the Trunk, and in the Spring when the Sap is up, cut those Branches close to the Trunk; and so shall you both have your Tree lusty, because no Sap is left in those vast Branches (which would have been lost, if you had Pruned them according to the usual manner, in *March*, or *April*) and also then the Sap will come purling out, and soon cover the Wood; whereby you shall avoid those blemishes in your Trees, which others procure by Pruning them in the Winter: Proved by *Mr. Andrew Hill*. *Sir Hugh Plat, ibid. Experiment 99.*

11. Another way of Pruning Fruit-Trees.

In Pruning of your *Fruit-Trees*, or any other Plant, or Shrub-bearing Fruit, you must always have respect whether it bears its Fruit upon the first, second, or third Years Sprout; for you must never cut away all the bearing Sprouts, if you mean to have any Fruit. As in *Pippins*, the third Years Sprout doth only bear Fruit; and in some other *Fruit-Trees* only

PARAGRAPH IX.

Experiments and Observations of Grafting.

I. Of what Plants will take, being Grafted of different kinds.

TIs known that *Plums* will not grow upon *Cherries*, nor
Pears upon *Apples* for many Years, tho for a while they
may prosper.

I find that divers Plants will take by Enarching, or Ablation, that will not take by common Grafting; so *Grapes*, as the early red upon the great *Fox-Grape*, *Apricots* also, and *Peaches*, which being secur'd upon their own Stocks, will admit implantation upon another also, and take unto it, which by Grafting I could never bring them to.

The strangest Conjunctions that we observe to agree, are the *White-Thorn* with the *Pear*, *Quinces* with the *Pear*, the *Pear* with the *Quinces*, the *Medlar* with the *White-Thorn*, the *Apricot* with the *Plums* that are full of Sap, and sometimes upon hard scurvy *Plums*, most use the *White Pear Plums* for that purpose; I find not but some other are as good, viz. the *Primordian*, *Muscle*, and *Violet*. And it is true, that all *Roses* cement and continue well upon *Bryars*, as on the *Sweet-Bryar*, and *Dog-Rose*.

I have *Cherries* that grow upon *Plum-stocks* (which is Sir Hugh Plat's Experiment in his *Garden of Eden*, p. 113.) and *Currants* upon *Gooseberries*; what duration they may be of, I expect to learn. I am not convinced by Experience, that *Pears* upon *White-Thorn* are worse in their Fruit; but if so, I shall prefer *Apple-Kernels* before *Crabs* for a Nursery.

I have tasted very excellent *Katharine Pears* without Stone or Hardness, that came from a *Thorn-Stock*; nor were they smaller or harder (which Mr. Tavernor asserts) than ordinary Fruit upon the proper Stock; however, I advise such as use *Thorn-stocks* to graft very low, for otherwise the *Thorn* not growing proportionably to the Graft, will cause the Graft to decay, being never able to grow thereon, to the bigness usual in *Pear-Trees*, Mr. Sharrock's *History of the Propagation and Improvement of Vegetables*.

2. Of the time of Grafting.

The time of Grafting, possibly is any time of the Winter; I have seen Apples Grafted in November, and at Christmas, and yet thrive very well; but the best time is that which immediately precedes the Spring; if you can, let the Cyons be gathered before the Trees shoot their Buds, tho' some will grow now and then, notwithstanding they be sprouted. It is no matter tho' the Stocks are Budded; I have, at Easter, Grafted above two hundred Apples and Pears together without any fail. Sharrock, *ibid.*

3. Of improving the double yellow Rose by Inoculation.

Whereas, says my Author, all other *Roses* are best Natural, the Double-yellow is best inoculated upon another Stock; others thrive and bear best in the Sun, this in the Shade; therefore the best way that I know to cause this *Rose* to bring forth Flowers, is performed after this manner.

First, In the Stock of a *Frankford* Rose, near the Ground, put in a Bud of the single yellow-Rose, which growing, the Suckers must be kept from the Root; and all the Buds rub'd off except those of the kind desir'd, which Berry grown big enough to bear (which it will be in two Years) it must in the Winter be prun'd very near, cutting off all the small Shoots, and only leaving the biggest, cutting off the Tops also as far as they are small; then in the Spring, when the Buds for Leaves come forth, rub off the smallest of them, leaving only some few of the biggest, which by reason of the strength of the Stock, affording more nourishment than any other, and the agreeable Nature of the single yellow-Rose, from whence it is immediately nourished, the Shoots will be strong and able to bear out the Flowers, if they be not too many, which may be prevented by nipping off the smallest Buds for Flowers, leaving only such a number of the fairest, as the Tree may be able to bring to perfection; which Tree would stand something shadowed, and not too much in the heat of the Sun, and in a Standard by it self, rather than under the VVall.

These Rules being observed, we may expect to enjoy the full delight of these beautiful *Roses*, as I my self have done by my own Practice in divers Trees so handled, which have Yearly bore store of fair Flowers, when those that were Natural, notwithstanding all the helps I could use, have not brought forth one that was kindly, but all of them broken, or, as it were, blasted. *Mr. Rea's Flora.*

4. *Of chusing Grafts.*

Make choice of your Grafts from a constant and well-bearing Branch, if you can conveniently; others may do very well: But the Grafts of such Trees as are ill bearers, or not come to bear Fruit, are to be rejected; the Grafts always partaking of the Quality of the Tree from whence they were taken.

Also chuse not those that are very small and slender, for they commonly fail; but take the fairest upon the Tree, and especially those that are fullest of Buds.

Once for all observe, that the stumpy Graft will be found much superiour to the slender one, and make a much nobler and larger Shoot. *This upon Experience. Mr. VVorlidge Systema Agricultura.*

5. *Of the manner of Inoculating.*

One some smooth part of the Stock, either near, or farther from the Ground, according as you intend it, either *Dwarf-Tree*, or for the Wall, or a tall Standard, cut the Rinde of the Stock overthwart; and from the middle thereof, gently slit the Bark, or Rinde about an Inch long, in the form of a T, not wounding the Stock, then nimbly prepare the Bud, by cutting off the Leaf, and leave only the Tail about half an Inch from the Bud; then slit the Bark on each side the Bud, a little distance from the Bud, and take away the Bark above and below, leaving the Bark half an Inch above and below the Bud, and shaven that end of the Bark below the Bud, like a Shield, or Escutcheon, that it may the more easily go down, and unite between the Bark and the Stock: Then with your Quill take off the Bark and Bud dextrously, that you leave not the Root behind; for if you see a hole under the Bud on the inside, the Root is gone, cast it away, and prepare another. When your Bud is ready, raise the Bark of the Stock on each side of the slit (preserving as carefully as you can the inner thin Rind of the Stock) put in, with care, the Shield, or Bud between the Bark and Stock, thrusting it down until the top joyn to the cross Cut; then bind it close with your Yarn, &c. but not the Bud it self.

There is another way of Inoculating more ready than this, and more successful, and differs from the former, only, that the Bark is slit upwards from the cross Cut, and the Shield or Bud put upwards, leaving the lower end longer than may serve; and when it is in its place, cut off that which is superfluous, and joyn the Bark of the Bud to the Bark of the Stock, and bind it as before, which sooner
and

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and more successfully takes than the other, as I my self have Experienced.

I have also cut the edge of my Bark about the Bud square, and have cut the Bark of the Stock fit to receive the same, and bound it fast; which succeeded well, and is the readier way, and more facile. Mr. Worlidge, *ibid.*

5. Of Grafting a Cherry upon a Plum-Tree by Inoculation.

A Cherry prospers well upon a Plum-Stock; but not *e contra*: And therefore, if you graft a Cherry in the Bud, upon a Branch, or Bough of a Plum-Tree that doth bear, you may make the same Tree to bear both Plums and Cherries: Proved by Mr. Hill. Sir Hugh Plat's Garden of Eden, Experiment 47. of Trees and Plants.

2. Of what Stock one may Graft on.

* You may Graft upon a bearing Bough of an Apple-Tree, a contrary Apple; and when that Cion is grown great enough to receive another Graft, you may graft a contrary Fruit thereon; but an Apple-Cion doth not agree with a Pear-Stock (nor *e contra*) nor a Plum upon an Apple, or Pear-Stock, neither will any Cion of a Fruit-Tree take upon an Elm-Stock; proved by Mr. Hill. Sir Hugh Plat, *ibid.* Experiment 63.

8. Of Grafting Quinces, or Medlars.

A Quince may well be grafted upon a Medlar-Stock; and a Medlar will grow, but not prosper so well, upon a Quince-Stock, because the Cion will out-grow the Stock; proved by Mr. Hill. Sir Hugh Plat, *ibid.* Experiment 64.

9. Another of Grafting Medlars.

If you graft a Medlar upon a Quince, it will bring a fair and large Medlar; proved by Mr. S. Sir Hugh Plat, *ibid.* Experiment 94.

10. Of grafting at Christmas.

You may graft an Apple Cion at Christmas, if you graft him very deep into the Stock, *viz.* four Inches, or, three at the least, and close it well: For tho' the Sap rise not, yet the

the moisture of the Stock is sufficient to preserve the Cion, till the Sap do rise; proved by Mr. Hill. Sir Hugh Plat; *ibid.* Experiment 68.]

II. *Of Grafting, so as the Fruit may come without Stones, and be (for the most part) hid under the Leaves.*

Graft the small end of the Cion (or Graft) downwards; and so of *Pears* and *Apples*, and they will have no Coar: *Quere* of *Plums* grafted upon a *Willow*, to come without Stones. Also, such *Apples* and *Pears* thus grafted, will, for the most part, hang under the Leaves, and not be seen unless you come under the Trees; proved by Mr. S. Sir Hugh Plat, *ibid.* Experiment 92.

PARAGRAPH X.

Experiments and Observations of Remedi- ing the Diseases, Annoyances, &c. incident to Land, Herbs, Trees, and Shrubs.

I. *Of curing cold and moist Land.*

Bogginess and Obstruction of Springs more or less, is generally the cause of the Chill, or Coldness that lies upon Land, and breeds the *Rush*, and other incommodities; and therefore the Foundation of the Cure of such Land, must be to remove this internal Cause, by *laying the Ground dry*, and *draining the Bog*: And concerning the way to do this, I shall give you Mr. *Blith's Observations and Directions*, who was both a Practiser himself, and questionless a true Reporter of his *Experience*.

In cold rushy Land, says he, the Moisture, or cold hungry Water is found between the first and second Swarth of the Land, and then oft-times you come immediately to a little Gravel, or Stoniness, in which this Water is; and sometimes below this is a hungry Gravel; and many times this Gravel, or Stoniness lies lower: But in boggy Land it usually

usually lies deeper than in Rushy ; but to the bottom where the spewing Spring lies, you must go (and one Spade's depth, or graft beneath, how deep soever it be) if you will drain the Land to purpose.

And as for the *Matter*, or *Bog-maker*, that is most easily discovered ; for sometimes it lies within two foot of the Ground, and sometimes, and very usually, three, or four foot : Yet some lie far deeper, six, eight, or nine foot, and all these are feizeable to be wrought, and the *Bog* to be discovered ; buttill you come past the *Black Earth*, or *Turf*, (which usually is two or three foot thick) unto another sort of *Earth*, and sometimes to old *Wood* and *Trees* (I mean the Proportion and Form thereof, but the Nature turn'd as soft and tender as the *Earth* it self) which have lain there no Man knows how long ; and then to a white *Earth*, and many times like *Lime*, which the *Tanner*, and white *Tanner* takes out of their *Lime-Pits*, and then to a *Gravel*, or *Sand*, where the *Water* lieth, and then one Spade's depth clearly under this, which is indeed nothing else but a *Spring*, that would fain burst forth at some certain place, and which, if it did break out and run quick and lively, as other *Springs* do, your *Bog* would die, but being held down by the power and weight of the *Earth* that opposeth the *Spring*, which boyls and Works up into the *Earth*, and, as it were, blows it up, and fills the *Earth* with *Wind*, as I may call it, and makes it swell and rise like a *Puff-ball*, as you shall seldom, or never find any *Bog* but it lies higher, and rising from the adjacent *Land* to it ; so that I believe, could you possibly light on the very place where the *Spring* Naturally lies, you need but open the very place to your *Quick-Spring*, and give it a clear vent, and certainly your *Bog* would decay ; by reason whereof it has so corrupted and swollen the *Earth*, as a *Dropsey* doth *Man's Body* ; for if you observe the *Mould* it is very light and hallow, and three Foot square thereof, is not above the weight of a solid Foot of Natural *Earth*, *Clay*, or *Land* ; whereby I conceive, that how much soever this *Mould* is forced from the Natural Weight, or Hardness of solid *Earth*, or *Clay*, so much it is Corrupted, Swollen, or Increased, and blown up, and so much it must be taken down, or let forth, before ever it be reduced ; I therefore prescribe this Direction : Go to the bottom of the *Bog*, and there make a *Trench* in the sound *Ground*, or else in some old *Ditch*, so low, as you verily believe you are under the level of the *Spring*, or spewing *Water*, and then carry up your *Trench* into your *Bog*, and streight through the middle of it, one foot under the *Spring*, or spewing *Water* upon your *Level*, unless it rise higher, as many times the *Water*, or *Spring* riseth, as the *Land* riseth, and sometimes lies level with the head of the *Bog*, unto which you must carry your *Drain*, or within two or three *Yards* of the very head

head of it, and strike another Trench overthwart the very Head both ways from that middle Trench, as far as your *Bog* goeth, all along to the very end of it, still continuing one foot at least under the same, and possibly this may work a strange change in the Ground of it self, without any more Trenching.

Or thus you may work in somewhat a more certain way, but more chargeable, *viz.* After you have brought a Trench to the bottom of your *Bog*, then cut a good substantial Trench about the *Bog*; (I mean, according to the form of your *Bog*, whether round, square, or long) or three or four Yards within your boggy Ground; for, so far I do really believe, it will drain that which you leave without your Trench, at the depth afore-said, that is underneath the Spring Water round; and when you have so done, make one work, or two just overthwart it, upwards and downwards, all under the Matter of the *Bog*, as is afore-said; and in one Years patience, through God's Blessing, expect your desired Issue: And if it be in such a place as will occasion great danger to your Cattel; then having wrought your Works and Drains as afore-said, all upon straight Lines (by all means prevent as many Angles, Crooks, and Turnings as is possible, for those will occasion but stoppages of the Water, and filling up of Trenches, and loss of Ground, and much more Trouble than otherwise.) Then you must take good green Faggots, *Willow*, *Alder*, *Elm*, or *Thorn*, and lay in the bottom of your Works; then take your Turfs you took up in the top of your Trench, and plant them thereupon with the Swerd downwards, and then fill up your Works level again, until you come to the bottom, or nether end of your work, where your Trench is so shallow, that it will not endanger your Cattle: Or rather take great Pibbles of Flint-Stones, and so fill up the bottom of your Trench about fifteen Inches high; and take your Turf and plant it as afore-said, being cut very fit for your Trench, that it may lie close as it is laid down, and then having covered it all over with Earth, and made it even as the other Ground, wait and expect a wonderful effect through the Blessing of God; but if you may, without eminent Danger, leave your Works open; that is most certain of all. *Blith's English Improvement.*

2. Of curing cold and dry Land.

For such sorts of cold Land as are found and not spungy; or Dropfical; the way to make them useful to the Husbandman and Grazer, is to add to them some store of the more hot and active Principle, such as abound in Spirit, or Volatile Salt; such are *Hen-Dung*, *Pigeon-Dung*, *Soot*, and the like; to which *Mault-Dust* may be added; but is then most useful

useful when impregnated with these Dungs. For there is some of the Spirits of the fermented Barley in the *Malt-Dust*, with which the Earth is dispos'd to such a fermentation as is proper to make it fruitful in the production of Vegetables. Yet that Spirit is so subtile, that in a dry time it soon exhales, and therefore in a dry Year worketh not so great an Improvement as is in a wet one: For this *Malt-Dust* our Husband-Men gives twelve pence the Bushel, which they generally (where they have the conveniency) spread in a Dove-House, or else in a Hen-House well stor'd) that Pigeons may pick it, and further enliven it with the Heat and Virtue of their *Dung* before they sow it: For all these powerful *Medicines* are to be bestow'd in small quantities, and therefore Sow'd by the Hand for fear of burning the Chits, and killing the Corn in its first Germination. *I have observed*, That where these Dungs have been over plentifully laid, the place bare no Corn at all; whereas in the same place, where it is moderately strewed, there was a vast improvement of the Crop.

Urine is esteem'd a great help to cold Land from the same Principle, and therefore the same caution is to be used; that the parts of it be disseminated, and not laid too thick. *I have seen* half the Trees in a *Codling-Hedge* kill'd by watering them too much with *Urine*.

And the improvement is full as great in cold Pastures and Meadows as on Plow'd Lands, both by *Malt-Dust*, and the mentioned *Dungs*. *I have seen* an Experiment made of divers of these together, on several parts of the same Ground, where it appear'd, that the improvement was greatest by *Soot*, the second place had *Pigeon's-Dung*. *Mr. Blich*:

3. Of curing the Driness of Ground.

Driness is generally a great cause of Barrenness, and is an usual Annoyance in Sandy and Gravelly Grounds, more especially that they retain not the Rain Water so well as Clay, or Land of a mixt Soil: The proper Remedy for this Defect is artificial Watering (of which see *Paragraph 6. Num. 1.*) which tempers the Ground most properly for the improvement of the growth of the most useful Plants, *Grain* and *Grass*: For Water in its own Nature and Property, is a Soil, and has an exceeding agreeableness with the Bodies of most Vegetables, as appears by the Experiments of their growth in Water only. (Mentioned *Paragraph XI. Observation VI.*) *Sharrock's History of the Propagation and Improvement of Vegetables.*

4. *Of preserving Corn from Blasting.*

Tho' Mr. *Blith* reports, and Mr. *Hartlib* likewise, That the Natural Helps to preserve Corn from *Blasting*, is the Steeping of it in thick fat Water, or *Lime-Water*, *Urine*, or *Brine*; or the mixing of *Lime*, or *Ashes* with Corn well wet and moist, that so it may cloath it self with the finest of the *Lime*, or *Ashes*, &c. so as it may fall cloathed all over to the Earth, and so be covered therewith: Yet, the very last Year it was observed, That where those Means were used, the Blast did as much harm as on the adjoining Lands, where there was no such Applications made to the Seed. And, indeed, blasting being the perishing of the tender Kernel, by reason of a Wind (which, from its effect, is sometimes call'd a Red-wind) that too sharply, (and it may be with some Venom) breathes on it at its first beginning; I see no reason that such Infusions and Applications should be any Defence; for it comes from an outward Violence, and therefore it is most usually seen, That not half a Tree only, but half a Bough shall be blasted, while the other half of the same, that grows by one and the same Nourishment, remains free, sound and well-coloured. *Sharrock*, *ibid*.

5. *Of preserving Corn from Smuttiness.*

Some Authors prescribe the Steeping of Corn in thick fat Water, or in *Lime-Water*, *Urine*, or *Brine*, or the mixing of *Lime*, or *Ashes* with the moisten'd Corn, to preserve it from *Blasting*: But I believe they are mistaken in the Application of the Medicine to the prevention of the right and proper Disease: For, I have heard such who practiced these Medicines, to affirm, That they have generally (and with reasonable good success) used those Remedies to prevent *Smuttiness*. *Sharrock*, *ibid*.

6. *Another of the same.*

A good Reason to prove, that Wheat when is is at the best, decays soonest, you shall see in this following Experiment.

Sow of this Wheat the next Year, whether it be washed or not washed, yet it will be very *Smutty*; whereas if you Sow leaner, or a middle Wheat on the same Land, and at the same Season, yea that very Day, yet the one will turn *Smutty*, and the other will not; which proveth that the plump and fullest Wheat, being at its height and period, Returns,

Returns, Decays, and comes to Nought, being *Smutty*. Mr. Remnant, Lib. 2. Cap. 3.

7. Of curing the Mildew of Corn and Hops.

It may be truly said of *Mildew*, That it is not to be prevented by *Liming*, or *Brining*, or any other the like means. It is a good Account of the Cause and Cure of this Accident that is deliver'd by Mr. Remnant, Lib. 2. Cap. 3. which take as follows.

Mildew, says he, is a fine, thin, sweet Dew; when it falleth, no Dew, or Water in the Earth is so thin as I know of; yet if it lye till the Sun, or Heat come upon it, or Winds dry it, then it becomes clammy, stiff and binding; but the worst effect it has is upon Wheat and Hops.

It falls commonly in the warmest and stillest Weather; it is exhaled or drawn up by the Sun out of the Flowers, and from sweet things, or sweet places of the Earth, and it is most frequent in the height of Summer, and warm Weather, especially a little before Wheat-Harvest: So that Wheat is taken by it when it is full Corn in the Ear, and the Straw is dry, and beginning to change white. It falls sometimes in the Night, sometimes in the Day, but most of all in Cloudy, Misty Gloomy Weather: The which to find out, keep Bees, and they will be your Intelligencers, if it is in the Night, they will out together as soon as the Day is light, or if it fall by Day, they will abroad together though it fall fast, and as big as a pretty Rain.

Therefore, when you see the Bees fly thus early and diligently, before there is a sweet Dew fallen; then make haste before the Sun, or Driness cometh on it, and get help, and away into your Wheat, and with a Line, or Rope, run over your Wheat as fast as may be, one in one Furrow, and another in another, a Land two or three distance, as you can well reach, one at one end and the other at the other end of the Rope, or Pole; and the least touch, or wagging will shake it off, it is so exceeding thin when it is new fallen; yet if you have time and help, it were good that you went backward as well as forward, to make sure work.

But if you let the Dew alone, it will stick fast, when Heat or Driness comes upon it, and so in time will rot your Wheat, so that no moisture, or Nourishment can come out of the Root into the Ear, and then your Corn withers in the Ear for want of Nourishment.

This Dew will, in time, stick fast and become Clammy, and bind like Turpentine, or Birdlime; first straked on the straw, and within a while all over black; while the Wheat is green, and there is no moisture in the Straw, so long the *Mildew* doth no hurt; so, likewise when the Corn is hard,

hard, and dead ripe in the Ear, it is past danger, so that the greatest hurt is done between the time that it begins to change colour, and the full ripening; and if you be careless and negligent in this time, be sure your Wheat will be dry'd up with the Sun, and shrunk in the Ear, and blasted, which by God's Blessing, and your small Pains and Diligence, you may prevent.

Some have slighted and contemned these weak means for a while, but after better consideration, have made use of it, and found the Benefit, and were thankful for it. The Mildew is also to be perceived upon the Oaken-Leaves shining and sweet; but having your Intelligencers (the Bees) at home, you need not seek abroad.

Hops are very often blasted by the *Mildew*; when therefore this Dew falleth, shake your Hop Poles, and with a gentle Wand, beat off this Dew from the Leaves, and if it be not too much labour, wash it off also by throwing Water upon them, if you see that it will not come off with shaking: For if it stick on, and continue, you shall see Worms and Bobs breed and stick there, and so spoil your Hops, and they will be Lowfy and Filthy, and much impaired, if not all lost. Now if you be diligent and watchful herein, you may, by God's Blessing, receive double and trebble, or greater Recompence of your Pains, and preserve abundance which former Ages have lost. *Mr. Remnant, Lib. 2. Cap. 1.*

8. Of destroying Moles.

Moles by watering are Drown'd, or driven up to so narrow a compass, that they may be easily taken; *I have known* them to have been forced to leave their Holes and run upon the Turf, to save their Lives from the Water-Flood. *Sharrock ubi supra.*

9. Another of the same.

Mr. Blish relates, That one Spring, about March, one Mole-Catcher and his Boy (in about ten Days time, in a Ground of nine Acres, being just laid down from Tillage) took about three Bushels of them old and young; they were to be numbred, most of them being young and naked; and this he did, only by casting up their Nests, which are always built in a great heap, of double bigness to the rest, most easily discerned; and then the old Ones would come to look their Young, which he would snap up presently also: At another Season than March (which is their breeding time) such success is not to be expected. *Mr. Blish ubi supra.*

10. Of destroying Fern or Brakes.

Fern is a great annoiance of some land: For the destruction of it, some Authors give this Prescription. In the Spring, when the *Fern* begins to grow a little above the Grass, while it is young and tender, Take a crooked Pole, or piece of Wood about six Foot long, coming at one end like a Bow, or made like a blunt Sythe; With this strike off all the Heads of the *Fern*, as low as you can, even to the Ground, if possible; do this the Second or Third time, and it proves generally a certain Remedy. The Reason, as I suppose, is the Putrifaction of the *Fern*, it being a very moist muscilaginous Plant, by its own juice, and the moisture of the Earth, by which the very Roots themselves come to be corrupted; or else the deprivation of all the Buds that germinate from the Root, by cutting off the the Sprouts so unseasonably. *Sharrock ubi supra.*

11. Of destroying Ants or Pismires.

Pismires, especially of the black kind, are exceeding troublesome in some Gardens; for they climb the highest Trees, and spoil the Fruit, and are comonly esteem'd remediless. *Belonius*, who took exceeding pains for improvement of Vegetables, commands the decoction or Broath made of any sort of Spurge, as very efficacions for this purpose. Some draw them to one place, by burning Carrion where most they resort, and then scald them with seething Liquor. *Sharrock ubi supra.*

12. Of destroying Ear-wigs.

To divers Choice Flowers, (but Carnations and Gil-liflowers especially) *Ear-wigs* are a great annoiance: Mr. P.'s way of setting Beasts Hoofs among the Flowers, upon Sticks, to take them, is us'd of every Body here, and generally liked. Some that set their Flowres in Pots, set the Pots in Earthen Plates, with double verges, containing Water, or Water mingl'd with Soot in the outward verge, to drown the vermin that shall attempt the Pots, and Rain-water in the second, which may pass through the Holes in the Pots, to water the Earth therein contain'd. *Sharrock ubi supra.*

13. *Of destroying Caterpillars.*

I Know no better way to destroy *Caterpillars*, *Palmer-worms*, and other vermin of that kind, than by crushing their Eggs, as soon as they are laid upon the Leaf by the Fly; some brush them off with wet Cloaths: 'Tis Observ'd that the Fly that usually blows upon the Cabages, chuses such Plants as are youngest, and especially those that were raised upon Hot Beds, or indured least of Cold in the Winter preceding. *Sharrock ubi supra.*

14. *Of curing Trees that are Bark-bound.*

The Remedy for this disease, (both in *Cherry Trees*, and other *Trees*, those chiefly whose Barks are hardned and grown crusty by long standing in shadowy places, or barren Ground,) is, that (the year after their removal, or upon addition of better soil, in *straight grain'd Barks*; (as Apples, Pears, &c.) And without either removal or addition of Soil in *Cherry Trees*, and other *cross grain'd Barks*; or in any *Trees* whose Barks rend of their own accord,) the Bark be slit from the Top of the *Tree*, to the Bottom of the stock, and that according to the bigness of the *Tree*, in one, two, or three places: This is a Chyrurgical Remedy that never fails, and is easily perform'd. *Sharrock ubi supra.*

15. *Another of preserving Corn from smuttiness.*

Common Salt is of singular use, (as daily *Experience* testifies,) being dissolved, and seed *Corn* steep'd therein, to prevent the *Smut*, and add fertility to the Seed. *Mr. Worlidge's Systema Agriculturae.*

16. *Another of the same.*

The most effectual way to prevent Smutting or burning of any *Corn*, is to Lime it before you sow it, as is found by daily *Experience* in *Sussex*; where since this practice of Liming, they have no burnt *Corn*, whereas before they had abundance. They lime it thus, First they wet the *Corn* a little, to make it stick; and then sift or sprinkle powder'd Lime upon it, (this *Observation* my Author receiv'd from his Honour'd Friend *Walter Burrel, Esq;* of *Cockfield* in *Sussex*.) *Mr. Ray's Collection of English words.*

17. *Of driving away Rooks from Corn, &c.*

Rooks, if they infest your *Corn*, are more terrified if in their sight you take a *Rook* and plucking it Limb from Limb, cast the several Limbs about your Field, than if you hang up half a dozen dead *Rooks* in it. Mr. Ray, *ibidem*,

PARAGRAPH XI.

Experiments and Observations Miscellaneous-Terræcultural.

1. *Of Plants delighting in the Air.*

ALL *Plants* have a peculiar delight in the Air, as I have prov'd by this *Experiment*. I have taken young Seedlings in a Pot, and set the Pot in a window where there was a Quarry out; the Seedlings would immediately leave its upright growth, and direct its Body straight to the hole, and so become almost flat and level with the Earth in the Pot: Then turning the Pot, so that the Inclination of the Stalk might be from the hole, the *Plant* has then crook'd it self in the form of a horn, or the Letter C, to the Air again. Upon the second turn of the Pot, the upper part of the horn being placed from the hole, the *Plant* would, with its upper part, return to the open place, and leave the stalk now in the form of an S. Nay, sometimes I have bid Persons tell me which way they would have such a *Plant* grow; they have marked the place in the brim of the Pot, and that Mark I have turn'd to the hole in the window; by which means the *Plant* (without any force, and that in not many Hours space,) has inclin'd its Stalk to the Mark made. Mr. Sharrock's *History of the propagation and improvement of Vegetables*.

2. *Of the cause of the Greenness of the Leaves, &c. of Vegetables.*

It has been Query'd by some, what it is that causes the Greenness in *Leaves*, &c. of all Herbs; and whether the

cold beating of the Air and Water upon Vegetables, may not have some influence in the production of this Effect?

I truly have been apt to think the affirmative, viz. That the coldness and briskness of the free Air, in Plants that grow on the Land; and the like quality of the Water, in Water Plants, produces that verdure or Greenness, which is generally the Beauteous vestment of all Vegetables; or at least, that it has some considerable influence, as to this production: For,

By Experience I have prov'd that Plants being in a choice room, brought up from Seeds in a Pot, or otherwise; Leaves and stalks prove to be White, or Pale, and not Green: And with this agrees the Lord Bacon's Experiment; who (Cent. 5, Exp. 47.) setting a Standard Damask-Rose-Tree, &c. in an earthen Pan of water; where bearing Leaves in the Winter, in a Chamber where no Fire was, the Leaves were found (as his Lordship relates) more pale and-light colour'd than Leaves use to be abroad.

Grass will likewise change its colour, if by any weighty Body (or other Body) lying upon it in the Field, it be kept from the Air. Mr. Sharrock *ibidem*.

3. *Another of the same.*

That the Air has a great Influence in producing the verdure of Plants may likewise not improbably be argu'd from the Experiments of Blanching, or whiting the Leaves of Artichocks, Endive, Mirrhiss, Succory, Alexanders, and other Plants; which is done by keeping of them warm, without the approach of the cool and fresh Air; whereby all Plants that otherwise would bear a green colour, became exactly white.

Hence it may likewise be, that the Roots of most Vegetables (that are under Ground, and cover'd from the Air) are (as is generally Observ'd) white; were ordinarily green: And many Roots that are by nature of a peculiar colour, as Radishes; yet the point of the Root that is deepest in the Ground, retains a whiteness, as well as other Roots, it being that part of the Root most remote from the Air; the red part commonly standing above, or just in the Surface of the Earth.

Hence also it may be that those Leaves of Cabbages and Lettice that are expanded in the free Air, are green; whereas those Leaves that are cover'd with their Fellows, and so secluded from the Blasts of the Wind and Weather, and kept in a warm covert, are always observ'd to be as white as any thing that is artificially blanch'd. Mr. Sharrock *ibidem*.

4. *Of altering the Colours of Flowers, &c.*

Our Gard'ners respect much the Roots of Widdows, for that they find by Experience, that they multiply the variety of Tulips

Tulips not only from Seeds, but also from the off-sets of those Widdows: *I my self have seen* admirable declensions of them from their natural Purple and White.

The Royal *Crocus* striped, gives now and then very pretty variety from its off-sets; as sometimes *I have seen* on the same Root an ordinary striped *Crocus*, and another of a perfect flame colour; tho' the variety here be not so great as in Tulips.

And seeing it evident, that variety of Colours sometimes comes from the weakness of the Plant, some Art may be us'd to alter the Colours, not only of off-sets, and slips, but also of *Flowers* arising from Mother Plants. For in Tulips, and Anemonies, and in Stock-Gilliflowers, and divers others, *I have seen* the *Flower* grow paler and more striped as the Plant has been weaken'd. And Mr. Ray tells us that as the expert Gard'ner endeavours to recover the sickly Roots of choice *Flowers*; so purposely he infects others with sickness that are more vulgar, by taking up the Roots a little before they come to *Flower*, and laying them in the Sun to abate their Luxury, and to cause them to come better marked the next year: This, says he, *I have often done* with strong lusty Roots of *Pas-Oudmard*, *Pas-Cittadel*, *Pas-Heron*, *Agot-Robin*, *Turloon*, *Widdows*, and such like ordinary *Flowers*, and commonly found the success answer expectation in many, and some of them to come so well marked, that they might be taken for better *Flowers* (by much) than they were. Mr. Sharrock *ibidem*.

5. Another of the same.

Kircher, a Learned Man, (I may call him the *Pliny* of his time) after he had reprov'd the Falsities in *Wecker*, *Alexius*, and *Porta*, (who had asserted a change of Colours and rare variety of *Flowers*, by sleeping those Roots in juices whose Colours were desir'd;) seems to me as much to be blam'd, in that he writes so confidently of things which are so much like Paradoxes, and equally gain-said by *Experience*.

He says, that he doubts not, but has from *Experience* these Effects; that a white Rose grafted upon a Red, will bring the *Rosa-Mundi*, or *Flower* both red and white. This *I have often prov'd false* by my own Tryals: That a *Jasmine* grafted on a Broom, will bring yellow *Flowers* like those of the Broom; that *I try'd*, and could not make to grow; so far it was from bearing any *Flowers*. V. Kircher, *Ars Magn.* p. 13. C. 6. But, that *Jasmine* upon *Jasmine* will grow and thrive, my own and others *Experience* can attest.

The same Dr. in another Book of his, *De. Magnete*, where he has many good Experiments about the Loadstone; yet as to his *πυλωμαγνήτισμος*, either he is out, or there is a greater difference betwixt the Country where he try'd his Experiment,

Experiment, and *England*, than I can imagine: For I have try'd Mulberries on Beech, Quinces, Apples, Pears, Elms, Poplars, and by grafting them they would not take; yet he affirms they take easily; and more, that Mulberries are (by conjunction with white Poplars) made to be of a white kind, and bear white Mulberries. That Pears being grafted on a Mulberry, bring a red Colour'd Pear, such as I suppose is that which we call the Bloody Pear; and that a Peach being inoculated on it, it sends forth a Bloody Peach, are his Assertions; which conjunction I see will not (with us) take; but if they would, I could promise my self no greater alteration of Colours thereby, than I find the Flowers of Roses, which I have try'd in very many different sorts, and Experienc'd to follow the Cyon without any participation of Colour from the stock.

I having heard the same Relation made of changing the Colours of Tulips by artificial grafting the Bulbs of the white and Red, and other Colours, by proportionable indentments in each Bulb: I try'd it this year in divers Roots, and made the incisions, and put together the parts as artificially as I could, according to the Rules here given; but the event is, that the Bulbs come not up at all, but die upon the operation. *Sharrock ibidem.*

6. Of setting of Plants, &c. in Water.

Because, says my Author, in some Disquisitions of natural Philosophy, there may some Matter of argument arise from the *Experiment* of the conversion of water into the Nutriment and Substance of various (and those very different) Plants, whereas some are hot, others cold; some esteem'd of a fresh, others of a Salt nature; some in regard of Man's Body, of healing, others of Excoriating and blisring Qualities; some Specificks for the Head, and the Diseases thereof, others for the Heart, and others for the Womb: I shall set down the Truth of some few Tryals concerning the Growth or corruption of such cutting of divers Vegetables as (without Roots) I kept in my Chamber in Vials of water. Not designing thence to make any motion towards the Restauration of the ancient Doctrine concerning the Production of all things out of water; or to take up the scatter'd Judgments of the once renowned *Thales*, which he made from the *Observation* of the Generation of Fishes, and Petrification by this Element, as likewise from the Influence (for he was aware thereof) and causality it has in the Production and Nourishment of Vegetables, and (if not immediately) by consequence of Animal Bodies. Nor desiring to make from these *Experiments* (tho' I believe the instance may be as well proper as specious) any argument for the more fashionable

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fashionable Opinion of *Epicurus*, by shewing the various productions that may be made by the divers shufflings and positions of that which has the repute of the most pure and defecated Element; but clearly intending to keep to my Task, which is History, and rather to serve, than to be the Philosopher. I in short rather content my self to give the Reader this account.

That in May 1658. In glasses of water, the Plants following grew from cutting, and made themselves Roots in the water, by name, they were *Balsamita-minor*, *Mints*, *Sedum-multifidum*, *Penny-royal*, *Bugle*, *Prunella*, *Water-creffes*, *Purple-grass*, *Dorias's*, *Woundswort*, *Crow-foot*, *Brook-lime*, *Marsh-mallows*, *Lawrel*, *Scordium*, *Tripolium*, *Knot-grass*, *Nummularia*, *Minima*, *Basil-mint*, *Curl-mint*, *Horse-mint*, *Penax-coloni*, *Feverfew*; and some others, which I kept no account of, I have had at other times.

Plants that upon this Tryal (made by Cuttings) did not grow being placed in Vials of water, were *Mugwort*, *Rosemary*, *Stock-gilliflowers*, *Alaternus*, *Lavander-cotton*, *Sage*, *Armeria's*, *Camemil*, and *Polium-montanum*.

Stock-gilliflowers, *Bawm*, *Tansy*, *Groundsel*, *Lavander-cotton*, *Sage*, and *Marjoram*, being likewise set in Glasses of water, dissolv'd into a Muscilage, and so corrupted before they attain'd to any Roots.

Plants that were corrupted by the water in some parts of the Stems, and so dy'd after Leaves sent forth and Roots shot, were *Basil*, *Mint*, *Marsh-mallows*, after it had grown a span, *Panax-coloni*, *Balsamita minor*, after six weeks growing.

Plants that increased in weight, small sprigs of them being cut, and planted in Vials of water, were these, and the quantity thus much. *Sedum-multifidum* in a Month increased in weight, half a Scruple: *Scordium* as much in a fortnight. *Dorias's*, *Wound-wort* grew in six Weeks gr. 13. *Bugula* in somewhat less time gr. 15. *Water-creffes* gr. 25. in a Month. *Ranunculus* half a Scruple in six Weeks, and *Periwinkle* as much; *Prunella*, *Brooklime* and most of the sorts of *Mints*, got weight proportionably.

As for the manner of Plants growing by water, I observ'd, that those Plants that had many joynts, easily grew, and put forth Roots only just at the Joint; as *Knot-grass*, *Crow-foot*, *Panax-coloni*, all sorts of *Mints*, *Penny-Royal*, *Scordium*, *Bugle*, *Brook-lime*, *Periwinkle*, &c. Which I conceive to be the reason, why in setting them the practice is, to cut off the Plant just in a joynt; for so the Roots immediately spring thence, and no part of the Stem corrupts, which it would, if it were cut off at the greater distance.

In those Herbs where there were no exact joynts, the Roots sprung forth under some Buds, as in *Tripolium*, *Dorias's* *Wound-wort*, and *Marsh-mallows*.

Every,

Every Root that was made, came forth at first very white and single, but afterwards in very handſom order and proportion, from thence aroſe other Fibres ſtriking every way in the water, where the ſides of the Vials made no impediment to the growth of the Spurs, iſſuing from the firſt and original Root. Mr. Sharrock *ibidem*.

7. Of ſetting Plants in Earth dry'd in an Oven.

There are ſome *Experiments* of that great Virtuoso Mr. Boyle, which are very proper to be inſerted in this place, aſcending [with the precedent] 5th Observation to prove [at leaſt ſpeciouſly] that all things are produced from water.

I [ſays Mr. Boyle] cauſed my Gard'ner in May to dig out a convenient quantity of good Earth, and to dry it well in an Oven, to weigh it, and to put it in an earthen Pot, almoſt level with the Surface of the Ground, and to ſet in it a ſeleſted Seed [He had before receiv'd of me for that purpoſe] of Squaſh, which is an Indian kind of Pompion that growes a pace; this Seed I order'd him to water only with Rain or Spring water. I did, [when my occaſions permitted me to viſit it] not without delight, behold how faſt it grew, tho' unſeaſonably Sown; but the haſting Winter hindr'd it from attaining any thing near its due and wonted Magnitude [for I found the ſame Autumn in my Garden, ſome of thoſe *Plants* by meaſure as big as my Middle] and made me order the having it taken up, which about the middle of October was carefully done by the ſame Gard'ner, who a while after ſent me *this Account* of it.

I have weigh'd [ſaid he] the Pompion with the Stalks and Leaves, all which weigh'd three Pounds wanting a quarter: then I took the Earth, and bak'd it as formerly, and found it juſt as much as I did at firſt, which made me think I had not dry'd it ſufficiently: then I put it into the Oven twice more, after the Bread was drawn, and weigh'd it again, but found it ſhrunk little or nothing: Boyle's *Sceptical Chymiſt*.

8. Another of the ſame.

To give you an account of your Cucumbers, [ſays my Author] I have gain'd two indifferent fair ones, the weight of them is ten pounds and a half, the Branches with the Roots weigh'd four pounds wanting two ounces; and when I had weigh'd them, I took the Earth and bak'd it in ſeveral ſmall earthen Diſhes in an Oven, and when I had ſo done, I found the Earth wanted a pound and a half of what it weigh'd formerly; yet I was not ſatisfy'd, doubting the Earth
was

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was not dry; I put it into an Oven the second time, (after the Bread was drawn) and having taken it out and weigh'd it, I found it to be of the same weight. So I suppose there was no Moisture left in the Earth: Neither do I think that the pound and half that was wanting, was drawn away by the Cucumber, but a great deal of it in the ordering was in Dust, and the like, wasted. Boyle *ibidem*

9. Another of the same.

The same Author (in the same place) adds a third Experiment of the great Van Helmont's in these words; he took two Hundred pound of Earth dry'd in an Oven, having put it into an earthen Vessel, and moistn'd it with Rain-water, he Planted in it the Trunk of a Willow Tree of five pound weight: This he water'd (as need requir'd) with Rain or with distilled water; and to keep the neighbouring Earth from getting into the Vessel, he employ'd a plate of Iron tin'd over and perforated with many Holes. Five years being effluxed, he took out the Tree, and weigh'd it, and [computing the Leaves that fell during the Four Autumns] he found it to weigh sixteen pounds and about three ounces. And having again dry'd the Earth it grew in, he found it to want of its former weight [of 200 pounds] only about two ounces; So that 164 pounds of the Roots, Wood and Bark which constituted the Tree, seem to have sprung from the water.

10. Of the Transmutation of the Species of Vegetables.

It is grown to be a great Question, whether the Transmutation of a Species be possible, either in the Vegetable Animal, or Mineral Kingdom. For the possibility of it in the Vegetable, I have heard Mr. Robart and his Son often report it, and proffer to make Oath, that the *Crocus* and *Gladiolus*, as likewise the *Leucoium*, and *Hyacinths* by a long standing without replanting, have in his Garden changed from one kind to the other, viz. The Saffron-Flowers into *Gladioli*: And for satisfaction about the curiosity, in the presence of Mr. Boyle, I took up some Bulbs of the very numerical Roots whereof the Relation was made, [tho' the alteration was perfected before] where we saw the divers Bulbs growing as it were on the same Stool, close together, but no Bulb half of one kind, and half of the other: But the change, time being past, it was Reason we should believe the report of good Artists in Matters of their own Faculty.

Mr. Wrench, a Skilful, and industrious Gard'ner for Fruit
and

and Kitchen-Plants, told me, that the last years there was a change between the Kinds of the Coleflower and the Cabbage. Others *Experience*, most confidently affirm, that they have Prime-Roses of a Milk-white Colour, the Roots whereof before (in another Ground) bare Ox-lips.

In the kind of purple Prime-Roses, *I have* taken up Roots, whereof the one half has at the same time born one or more Ox-lips, and divers Prime-Roses together with them. The Prime-Rose was the smallest sort of the purple Colour; the difference of the Flowers this, that the Ox-lip came up with an exceeding full Stalk, and many small Flowers thereon, the part of the Root that bare Prime-Roses, sent out many small Stalks, very much inferior to that of the Ox-lip, with Flowers like those born by the Ox-lip, the first that I saw of this kind, were in that excellent Chirurgeon, Mr. Day's Garden; where I was inform'd, that they were originally deriv'd from pure Simple Prime-Roses; but since *I have observ'd* them in divers other places. (*But my Author supposes here was no real Transmutation of Species; and to his Opinion I subscribe.*) Mr. Sharrock *ubi supra*.

II. *Of the descending of the Sap in Trees, &c.*

It was anciēty a generally receiv'd (tho' now as generally exploded) opinion, that the Sap of Trees, &c. Did (in Autumn) every year descend to the Root of the Plant; from whence it again ascended in the Spring. Mr. Sharrock being speaking of propagation by circumposition, says, Whereas it is suppos'd by some, that the Roots are made above the dismarked place, by the Descention of the Sap, which is supposed to be at the fall of the Leaf; *I have found Experience* very contradictory to their Supposals; for the Leaves fall not off till after Michaelmas; and Nature proceeds to the Germination and increase of Roots from the Spring all the Summer long; so that nothing can be argu'd rightly [from this operation, or the effect and product of Nature thereupon,] for that opinion, which makes the Sap to be every winter repos'd in the Root, as in a large Receptacle, and of its descention thither after every Autumn. If it were there as in a Repository, it were a wonder that Roots should be drier in December, than in May, or June, [which yet they are] and sensibly more void of juice. And if it did descend after Autumn, how could it ascend at the same time? That it doth then ascend, is manifest from this Experiment; take up a Tree, or other Vegetable, in the Fall of the Leaf; the Leaves will wither, and the Bark begin in a little time to wrinkle; then set it again in a proper Soyl, well water'd; the Effect will be, that the Leaves will recover freshness, and the Bark wax

Plump,

plump, and the Body firm, and full as before; which could not be, but by fresh supply of *ascending Sap*, to fill up the pores made by the weather and Exhalation of the Sun.

I am content to believe, that the Sap is in winter where I see it to be, *viz.* On the Body of the Tree coagulated, or encrusted into a new Coat, (of wood) encompassing the whole, which was not extant the year before; and on the top of the Tree, fashion'd into new Shoots, which visibly appear the product of *that Matter*, the place thereof is asserted to be elsewhere, and not where, upon the most sedulous inquest, it cannot be found. Mr. Sharrock *ubi supra*.

12. Of producing Mushrooms.

It is *Experienc'd*, that if the water wherein Mushrooms have been steep'd or wash'd, be pour'd forth upon an old Bed; or if the broken parts of Mushrooms be strowed thereon; that from these parts, as from a Seed, there will speedily arise store of Mushrooms. Sharrock *ubi supra*.

13. Of Chips of Elm's not growing.

There is a story freely and frequently defended, both in Discourses Printed and Spoken, that the Chips of Elm being Sow'd will grow; but this is somewhat like Kircher's *Experiment* mention'd above Num. 5. and not a whit more true; for if it were true, to Sow those Chips would be a profitable and frugal way of thickning Woods. The cause of this mistake amongst *Country-Men* (for I suppose not, that this Error arose from *Philosophers*) I imagine to be this: At the felling of great Elms many Chips must needs be scatter'd, and fly round about the Tree, and be cover'd in the grass; now the next year after the fall, there generally arises great Numbers of Suckers from the Roots of the old Tree; which Roots must emit all the Sap they gather up into these Suckers, the great Trunk being remov'd, and these Suckers are easily mistaken to arise from the Chips, because they always come upon the felling of Elms, where Chips are found, and grow at such Distance as Chips are ordinarily scatter'd. Sharrock *ubi supra*.

14. Another Observation of setting of Plants &c. in Water.

There is a Question now now-adays frequently propos'd, whether there be more soils than the ordinary Turf or Surface

Surface of the Earth temper'd with some water; (Soyl being meant for the Ground, in which things may be set to grow.) I need not (says my Author) speak much upon it, as to Water, which by *Experiments* formerly related [*which Experiments are inserted above, in Num. 6. of this Paragraph*] appears to have a property to elicit Roots, and make them where they were not, and nourish the Plants after they were made; to which I must add this Circumstance, not before mention'd, that *Periwinckle*, and divers others continu'd their growth by this nourishment alone, from year to year, not dying in Winter; how long they might have continu'd, I can't assert; for being absent this Winter, and no Fires being kept near, the water in the Glasses was Frozen, and so the Glasses broken, whereby the Plants perished; whereas otherwise, they being set in a Room over my Laboratory, I question not, many of them had continu'd till now. But—

15. *Of Vegetables growing in the Air.*

Some put forward, That the Air might have the faculty of nourishing Vegetables ascrib'd to it: And wonder when *Paracelsus* makes it a sufficient nourishment for Men, and brings Instances for the proof of his assertion. But I find, that *Onyons*, *Tulips*, and all Bulbous Roots, tho' they shoot out a green Leaf, yet do very much lessen in their Weight. And it appears that this growth, is but the motion of the same parts, or some few of them, to settle and gather in another place, and another order or Situation in relation to each others; for the *Onyon* particularly hath the thicker converging of the Bulb very much stretched out, and as each covering increaseth in *Length* and *Breadth*, by rising into a Leaf; so its *thickness*, which was considerable while it cover'd the Bulb only, decreaseth proportionably, and is fashion'd into a thinner and more largely extended Vestment.

I have hung up divers *Sedums*, *Orpines*, *Tithymalls*, and other such Plants, which I imagin'd most likely to grow by the Air only, and to increase and be augmented thereby; and found, that by all my endeavours, and tho' the Plants grew well, yet they always lost weight, and never got the fourth part of a Grain.

Aloes likewise, tho' being hang'd up in the Air within Clothes dipped in Sallat Oyl, it sends forth for many years new Leaves; yet it always grows less and less in weight, till at last [the old Leaves falling off, and new still coming up] it grows to nothing. *Sharrock ubi supra.*

16. Of Plants destroy'd by Weeds and Grasses.

Some make a Question, whether Plants of *the same kind*, (by reason of a Supposal that they require the same parts for nourishment,) or *Weeds and Grasses* by their too great Vicinity, may create more annoyance to their Neighbours? I decide not the Question, nor can I reconcile the Gardiner to Weeds, whilst he finds his strongest Plants destroy'd by them.

I have seen many Trees, (in a well grown Nursery) spoyl'd, by the Grass that grew amongst them; and as I remember, the very Bark of the Trees themselves was rotted, by a Dew, cast upon them by the Grass: *I have likewise observ'd*, a strong Quick-Set of white-Thorn, to have been destroy'd by Alexanders, which it is at the Readers Choice to account as a Weed or Cultivated Plant. *Sharrock ubi supra.*

17. Of the Acceleration of Germination.

Acceleration of Plants in their Germination and Maturity, is ranked, by the Lord Verulam, among the *Magnalia Naturæ*, and is an operation that all Artists can do something in: tho' I know not any that arrive to the performance of those grand proposals of some Writers; as that of raising Sallads within an Hour or two, whilst a joint of Mutton is Roasting. The late King of France, is reported to have known a secret process that would produce this effect, and to have esteem'd it at a high rate: Cichory was that Seed, as I was inform'd by Monsieur *Gilsonius* which he was wont to raise so soon into his most fam'd Sallad.

I have try'd divers of the *Experiments* propos'd for procuring those wonderful speedy Germinations, and that by long infusions in Milk, strong Muck-water, and sometimes have added Unquenched-Lime to the Infusions, (according to the Experiments set down by a late Writer, who asserts, that by these usages, Beans, Pease, and Parsly-Seed would grow up in few Hours) and can only give the Reader this Fruit of my Pains, that without any further Tryal, he may from my Experience, be ascertain'd, that the advantage in acceleration is exceedingly inconsiderable by any of these means: It was, *by my tryal*, found much less than I imagin'd could have been by any Infusion; for none of the Seeds (of which I try'd many sorts) came up the first three or four Days; and except Raddish, none came up a in fortnights time, tho' they were Sown in *August* and water'd.

I have likewise try'd the *Experiment* of Ashes of Moss: First, Burning a great quantity of Moss to Ashes, and then taking some of the richest Garden Mould I could procure from a rotten Hot Bed, and mixing it with the Ashes, I moistned it with exceeding good Muck-water several times, and let it as often dry in the Sun; this I did in glazed Pans, that the Salt might not be washed from the Earth; then I Sow'd Seeds, some unsteep'd, some steeped, and in the beginning of *Septem.* set the Plants upon the Leads of a House but in effect, the Salled sprang not up that Day, nor many Days after.

The next Day I set into some of the same kind of Soil, (made up of Moss Ashes and Dung, water'd as above,) divers Seeds steeped in Spirits of Urine alone, Spirits of Urine with water mixt, Spirit of Urine mixt with Phlegm of Elder Berries; all without success, tho' I set them in a Pan of Earth over a gentle Fire, to speed the Germination. Formerly I have seen Spirit of Nitre try'd, but to no purpose; some speak of working these suddain Germinations by somewhat made of Salt, Spirit, and oyl, Chymically united into one Body; which when they shall discover to us, or otherwise make us possessors of, we shall have a better opinion of the related Experiment.

As to ordinary Accelerations, Hot-Beds are the most general and catholick help, and certainly forward Germination very much: For Cabbage-Seed sown in the Spring on a Hot-Bed, I have seen to bring Plants, that have in their growth and bigness, overtaken such as were replanted before the antecedent Winter, and so were in the Ground, at least half a year before them; and that in the same sort of Soil. It is certainly true, that the Germination will be the more quick, the hotter the Weather is, and the larger the Bed of Durg is made, and the more it is helped by the reflection of Brick-walls, or other like advantages.

Mr. Speed, [*Cap. 24. of Musk-Melons*] gives us, (from the testimony of two Noblemen,) this Advertisement: The way [says he] to have as good Musk-Melons as any are in *Italy*, without the unwholsom use of the Musk-Beds here in *London*, is confirm'd by the Earl of *Dorset*. Plant them under a Wall, Pale, or Hedge, on the Sunny side, with very good Mould, purposely prepar'd, and underneath the Mould, lay a quantity of fresh Barly-straw, and by this easie means, [using the seasonable covertures, and necessary furtherance] you may attain to your uttermost desire, without any further trouble. But if you discern the Straw to make the Earth too hot, thrust a Stake thro' the mould to the Straw, that the Vapour and Heat may evaporate and pass forth.

I have known some Gard'ners about *London* and *Westminster* make

make considerable advantage by acceleration *Asparagus* upon a Hot-Bed; which they performed thus, These Roots having worn out the Heart of the Earth where they were set, in their ordinary Beds; the Gardiner where he found the most Cold, and the Root decline and ready to perish, takes up a Bed or part of a Bed at once, and at what time he thinks good in the Winter, he Plants the same Roots upon a new made Hot-Bed, which doth very speedily shoot out a fair Crop of *Asparagus* Heads, which [at that Season of the year] they sell at a great rate. And this *Experiment* may certainly be apply'd to any other Sallad, the tops or the young Leaves of which, are eaten; only they must all be expected whiter than such as grow expos'd to the Air and Winds, and the Roots, themselves to perish [by the Heat of the Hot-Bed] when the Crop is over. *Sharrock ubi supra.*

18. *Another of the same.*

There was sown in a Bed, *Turnip-Seed, Radish-Seed, Wheat, Cucumber-Seed, and Pease.* The Bed we call a Hot-Bed, and the manner of it is this. There was taken *Horse-Dung*, old and well rotten; this was laid upon a Bank, half a foot high, and supported round about with Planks; And upon the top was cast sifted Earth, two Fingers deep; and then the Seed sprinkled upon it, having been steeped all Night in Water, mixed with *Cow-Dung*. The *Turnip-Seed*, and the *Wheat*, came up half an Inch above Ground, within two Dayes after, without any watering. The rest the third Day. The *Experiment* was made in *October*; and [it may be] in the *Spring*, the Acceleration would have been the speedier. This is a *Noble Experiment*; for without this help, they would have been four times as long in coming up. *Ld. Verulam's Sylva Sylvarum.*

19. *Of the Acceleration of Maturity in Fruits.*

For Accelerating the Maturity of all *Wall Fruits*, the practice of *Midsummer Pruning* is everywhere almost observ'd; which is, the cutting off all parts of the shoots that are grown out far beyond the Fruit, and do otherwise take away both the Sap that might advantage the Fruit, and the benefit of the Sun likewise: This operation in Vines is called *Gelding*, and is usually transferr'd to Pumpions, Musk-Melons, and Cucumbers, and like Fruits, to Accelerate their ripeness. The joynt beyond the last Cluster of Gourds, is the place where the Creepers or shoots are to be nipt off, in Vines or Gourds: In other Wall-Fruits, the Gardiner clips them at a

convenient distance from the Wall, so as not to take away all the shade from the Fruit, which in some proportion is necessary, that the Fruit be not dry'd up, and burnt upon the Tree, by the torrid Heat of the *Midsummer* Sun, in such places where his Rays are reflected from a Wall, or Floor, or both.

'Tis also observed, that in Wall-Fruit, or any other that requires a reflected Heat, in order to the ripening of the Fruit, the lower the Boughs are spread, the sooner the Fruit ripens on a Wall; and in Standards, the lower and nearer the Earth any Plant is kept, the better shall it ripen, by reason of the reflection made from the Surface of the Earth; which if it be bare from Weeds, is equal to the reflection from some Walls. In *France*, Vines have no other Reflection but this, being tyed to Stakes, and not suffer'd to grow above a yard high; and in many places of *England* this only advantage, without Walls, brings Grapes to that Maturity which is ordinary in this *Island*.

The making *Orchards* of *Dwarf-Trees* is us'd upon the same reason; for thereby, here in *England*, your *French* Fruits, as the *Bon-cristien* Pear, and the like [which otherwise will not bear in this Kingdom, except nail'd to the Wall,] may be produced. And of this the Royal Garden at St. *James's* is an example. The contrivance of these *Dwarf-Trees* consists principally in these two particulars. 1. Grafting the Stock very low: and then, 2. By cutting off every year all the new Shoots or Cyons, except one Inch or two of the greater end, which may be enough to bear one or two Buds to sprout for the ensuing Summer; and thus only keeping the Knife from Blossoming-Buds, which are easily discern'd by the Gardiner; [and may be known by the Signs in *Parag. 8. Obs. 2.*] and the diligent Gardiner improves his Fruit by keeping his Trees as low as he can; commonly not above three quarters of a yard in height.

The twisting of the Stalks, of the Vine, [whereby the Bunches of Grapes are joyn'd to the Body of the Vine,] at such time when the Grapes are come to their full bigness, is practised by some for the accelerating Maturity; it may be, that this twisting, Channels that might otherwise carry more crude Sap into the Grape, being broken, the Heart of the Sun may more speedily reduce that which is already possessed by the Grape into sweetness, than if the fowre and undigested juice were still supply'd from the Vine. *Sharrock ubi supra.*

20. Of Retardation of Germination, &c. in Plants.

Retardation, or hindring Plants from running to Seed, is of use for the preservation of the Root and Leaf for there
are

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are many Plants, whose last endeavour being to bear Seed, presently die in all parts of them as soon as the Seed is perfected,

Of this kind are your best Carnations and Gilly-Flowers; to this kind also belongs divers Herbs, such as Parsly, Scurvy-Grass, &c. The spindles therefore of all such are timely to be cut off, the younger the better, in choice Plants, for fear of killing the Root. Nay, 'tis observ'd, by our Gardners, as likewise by *Ferrarius*, in his Chapter of the Culture of *Tulips*, that if those Flowers are suffer'd to grow to Seed, the the Bulb thereby is certainly much emaciated, and sometimes utterly perished; and therefore on all hands it is counted good to gather *Tulips* as soon as may be.

Some of the ways of Retardation are generally known; as particularly the Experiment of plucking off Rose-Buds as often as they spring, until the time you intend they shall proceed to Flower; or the making the Branches of the Rose-Tree bare of shoots once or twice in the Spring, for this purpose, are not unfrequently practis'd. And I have been inform'd by a Person of Credit, that at *Bristol* he saw Rases sold for four pence a Quart at *Michaelmas*, which were thus retarded, by setting the Plants late in moist Ground the same year: all which ways, I suppose, may well be transfer'd to other Plants of like nature, and this last way is not so common. *Sharrock ubi supra.*

21. Another of the same.

To make *Roses*, or other *Flowers* come late, is an Experiment of pleasure. For the ancients esteem'd much *Rosa-Sera*. And indeed the *November Rose* is the sweetest, having been less exhal'd by the Sun. The means are these—

First, The cutting off their Tops, immediately after they have done bearing; and they come again the same year about *November*: But they will not come just on the Tops, where they were cut, but out of those shoots, which were [as it were] *Water-Boughs*.

The second is, The pulling off the Buds of the Rose, when they are newly knotted; for then the Side-Branchees will bear.

The third is, the cutting off some few of the *Top-Boughs* in the spring time, but suffering the lower *Boughs* to grow on.

The Fourth, is by laying the Roots bare about *Christmas*, some Days.

The fifth is the Removing of the Tree, some Months before it Buddeth.

The sixth is the Graffing of *Roses* in *May*, which commonly

Gardeners do not till *July*; and then they bear not till the next year; but if you Graft them in *May*, they will bear the same year, but late.

The Seventh is the *Girding of the Body of the Tree* about with some Packthread.

The Eighth is the Planting of them in a Shade, or in a Hedge, [*My Author gives the Philosophical causes of all these Effects; but they being foreign to the Matter in Hand, I wholly omit to transcribe them.*] *Ld. Verulam ubi supra.*

22. *Of the Melioration of Flowers.*

My Author, where he casts off some *Experiments* as untrue, gives us a pretty one of his own: I will instance to you, [*says he*] what I have done, *viz.* I took Camomil, Valerian, Flag-Roots, and Celandine Leaves; these beaten together into a Salve, apply'd to the Roots of *Gilly Flowers*, when they are Planted or remov'd, and Water'd them with the same. It has propagated the Flower in bigness, so that it has made it as big again as any of the ordinary natural Flowers; and sometimes the Colours of them will alter that are thus order'd. *Steven Blake's compleat Gardeners Practice.*

23. *Another of the same.*

The same Author, [*in his Chapter of the Crocus*] has the like *Experiment* for the Melioration of the Flowers from Bulbous Roots: First, (*says he*) fill some Boxes with the finest Mould that may be had, and as dry as may be; set these Boxes in some Garret or Room where they may have Sun and Wind, but no Rain come at them, there let it stand for a Twelve-month; then get sheeps-blood, the juce of Valerian, Camomil, Mallows, and Capons-tai; mix these juices and the sheeps-blood together, then Water the dry Earth with this Substance; then take your Bulbous Roots as, Crocus, Tulips, Crowns Imperial, Lillies, Snow-Drops, and the like; Plant them in these Boxes, in their several times and seasons; anoint the Roots with this substance at their Planting, and Water them continually with the same, let them have no Rain, nor any kind of Water, but only this; but let them have the Sun, Wind, and Air enough, otherwise these Plants will corrupt: This done, your Flowers will spring out of exceeding large growth, and produce them very early, and I can positively say, *it will make them differ from what they were formerly.*

24. *Another of the same.*

The same Author, in his Chapter of *Tulips*, speaking of the *Alteration of their Colours* set, [says he] the Red Tulips by themselves, and the White Tulips by themselves, thus: Take a quantity of Wild or Garden Herbs, and sheeps dung and Pigeons-dung; beat the Herbs and the Dung together; when this is done, put some of this into the Holes where you set the Tulip-Roots; anoint the Roots with the same, and set them into the Holes, and put in more on the top of them, and cover them with Earth. This being done, it has alter'd the Colour of them, upon several tryals, some after one manner, and some after another. But still the Red and White carri'd the greatest sway.

25. *Of the Melioration of Trees.*

It is an assured *Experiment*, that a heap of *Flints*, or *Stones*, laid about the bottom of a Wild-Tree, (as an *Oak*, *Elm*, *Ash*, &c.) Upon the first Planting, doth make them prosper doubly as much, as without it, *Ld. Verulam, ubi supra.*

26. *Of change of Seed*

Of changing the Seed of the same kind, [besides Field-Corn, which is generally chang'd every third Season at the farthest,] Examples may be had in *Carnations* and *Gilly-Flowers*, the Seed of which, being taken from the best Flowers, are much meliorated by alterations and change of Ground; and 'tis like this Experiment may hold in the Seeds of other Flowers. *Mr. Sharrock ubi supra.*

27. *Of the Exossation of Fruit.*

Another *Experiment*, is the Exossation of Fruit, without Stones, or Core; for which effect, the Grafting of the upper end of the Cyon downwards, has been asserted to be a certain way. That the Cyon so Grafted will grow, *I have Experience*; but whether in time they will produce the foremention'd Effect, I greatly doubt: And if they should, I much mistrust their Expectations wou'd not be answer'd, that intend melioration thereby: For the Fruit, certainly, by the loss of the natural Seed, would be very much dispirited, and lose the Generosity and Nobleness of its nature, as Animals do, and as Vegetables sometimes; as particularly *I have observ'd* in *Barberries*; for *I have seen* a Tree, that bare every year;

(on most bunches) two sorts of Barberries, the one full, and of a deep Red; the other of a Pale colour; and thin Substance; and inquiring into the cause, I found the former to have Stones in them, and the latter destitute; which were, as I supposed, thereby emasculated. Mr. Sharrock, *ubi supra*,

28. *Of the Situation of Ground.*

The more uneven any Piece of Land is, the better it bears the Extremities of the Winter; for which reason in the open Champion where the Land is dry, and they do not lay up their Ridges as in other places, yet they harrow it but little, and leave it as rough as they can, for no other cause but to break the fleeting Winds. The Gardiners near London now seem to imitate this practice, by laying their Gardens in ridges, not only the better to shelter their Seeds from the Cold Winds, but also to give an advantage of the Sun, as I my self prov'd it many years since, that Pease Sown on the South of small Beds, (so raised, that they seem'd to respond the elevation of the Pole,) prosper'd well, and passed the Winter better, and were much earlier in the Spring, than those otherwise planted. Mr. Worlidge's *Systema Agriculturae*.

29. *Of Poling of Hops.*

Here, says my Author, (having been speaking of the practice of a *Yorkshire* Knight) I have just cause offer'd me to commend also the manner of *Poling* of his *Hops*, which he places in such sort, as that one Plant may not shadow another; but that his whole Garden receives the fullness and strength of the Sun Beams, at once; whereby both his Hops are more kindly, and the Bells of them much larger than in any other Hop-grounds, whose Poles are erected, and stand upright, after our ordinary and gross manner. [Therefore, I doubt not, but the way used by this Knight, was to place his Poles so oblique to the Horizon, that they may nearly point out the Equinox. But, [says my Author] because my promise was not, to deliver any Skill in Hop-Gardens, I will reserve this conclusion [with some other secrets in Hop-Grounds, not yet discover'd, or brought in publick use] for some apter occasion, *ut semper novus Veniam*. Sir Hugh Plat's *Jewel House of Art and Nature*.

30. *Another of the same.*

Set the Poles leaning outward, one from the other, that they may seem to stand equi-distant at the top to prevent Housling,

Houſling, as they term it, which they are ſubject to, if they grow too near the one the other; that is, they will grow one amongſt another, and cauſe ſo great a ſhade, that you will have more Hawm than Hops.

Alſo, it is eſteem'd an excellent piece of Husbandry, to ſet all the Poles inclining towards the South, that the Sun may the better compaſs them. *This is moſt evident*, that a leaning or bending Pole, bears more Hops than an upright. Mr. Worlidge, *ubi ſupra*.

31. *Of the Blaſting of Trees.*

I remember, [ſays my Author] that a great many Trees in ſome Land that belongs to me, having been ſuddainly much endamag'd by a Wind, that was not able to do it by its bare ſtrength; I had the curioſity to view ſomewhat heedfully a Tree that ſtood in the Garden, and perceiv'd that all the conſiderable miſchief was done to that ſide of the Tree, which reſpect'd the corner whence the Wind blew, the Leaves of the other ſide continuing freſh and verdant, as being by the other part of the ſame Tree ſenc'd from the Wind: And *it was further obſerv'd*, that even the expos'd ſide of the Tree was not every where engaged; for there were divers parts, where the Leaves continu'd ſound and green, tho' the Neighbouring Leaves were ſome more, ſome leſs [for all that were prejudic'd were not totally] blaſted: the ſound Leaves and the diſcolour'd being ſo odly mingl'd, that I conjeſtur'd the cauſe of the Miſchief to have been this; that ſome Arſenical or other corroſive or poiſonous Exhalations, being ſuddenly emitted from the ſubterranean parts into the Air, were by the Wind they chanced to meet with there, hurry'd along with it, and blown againſt the Bodies that ſtood in its way, moving in the Air, like Hail-ſhot diſcharg'd out of a Gun, here in a cloſer, and there in a more ſcattering order, ſo that as more or fewer of them happen'd to fall upon the ſame Branch of Leaf, they left more or leſs marks of their paſſage, by deſtroying the texture and colour in the Leaves or parts of them they chanc'd to beat upon. *Eſq; Boyl, Of the Salub; and Inſalub: Of the Air.*

32. *Another of the Exoſſation of Fruit.*

We have by an *Experiment* found ſome near affinity between the Kernel of the Apple and the Heart or interior part of the Stock. *For I ſaw* (ſays Mr. Beal, Fellow of the Royal-Society) an old rootten Kernel-Tree bearing a delicate Summer-Fruit, yielding ſtore of ſmooth Cider, ('tis call'd the *French Kernel-tree*,

tree, bearing a delicate Summer-fruit, yielding store of smooth Cyder, ('tis called the *French Kernel-tree*, and is also a Dwarf, as is the *Red-streak*) and examining divers Kernels, many Years successively, of that hollow and decay'd Tree, I found them always very small of growth, and empty, meer Skins of Kernels, not unlike to the emasculated Scrotum of an Eunuch; another younger Tree, issuing from the sounder part of a Root of the same old Tree, had full and entire Kernels.

And from such *Observations* might the production of Barberries, &c. without Stones, be happily attempted; an Instrument fitted to take out the Marrow or Pith of the Branches, (as the same Mr. Beal perform'd them;) for, from the same numerical Bush of that Fruit he found, *some* Branches produce Barberries that had no Stones, *others* that had; and in searching for the *cause* of the *effect*, perceived that the Pith or Heart was taken from the Radical or main Branches, of those, as the other was full of Pith, and consequently the Fruit in perfection; of all which (he writes me word) *he made several Tryals* on other Fruit, but left the place before he could see the event. Mr. Evelyn's *Pomona*.

33. *Another of the same.*

I have tasted very excellent Katharine-Pears without Stone or hardness, that came from a Thorn-stock: Nor were they smaller or harder (which Mr. Taverner asserts) than ordinary Fruit upon the proper Stock. Now I advise, that such as shall for want of Pear, use Thorne-stocks, that they Graft very low, for otherwise the thorn not growing proportionably to the Graft, will cause the Graft to decay, being never able to grow thereon, to the bigness usual in Pear-trees. Mr. Sharrock, *ubi supra*.

34. *Of some Seeds lying long in the Ground before they come up.*

In Seeds that are long in coming up, the Seed-bed ought not to be digged up the first Winter: For *I know* divers Seeds that will for a great part of them lye under Ground the first year, and come up the second; of this nature is the *Asl.-key* sometimes, the *Peach*, *Male-Cotone*, and some *Plums*. Mr. Sharrock *ubi supra*.

35. *Of altering the Colour, Taste, or Scent, of Fruits, or Flowers.*

All those fantastical Receipts, of changing the Colour, Taste, or Scent, of any Fruit or Flower, by infusing, mixing, or letting in at the Bark, or at the Root, (of any Tree, Herb, Flower) any cold, or aromatical Substance, Master Hill has often by *Experience* sufficiently control'd: And tho' some Fruits and Flowers, seem to have the Scent or Taste of some aromatical Body, yet that doth rather arise from their own natural infused quality, than from the hand of Man. Sir *Hugh Plat's Garden of Eden. Experim. 97.*

And Mr. Beale of *Somersetshire*, (Fellow of the Royal-Society) says (upon this subject,) some Apples are call'd Rose-Apples, Rosemary-Apples, Gillyflower-Apples, Orange-Apples, with several other adjuncts, denominating them, from what reason I know not. But if we intended to try such infusions upon the Kernels (as should endeavour to alter their kinds) we should not approve of the bedabbling them with such infusions, (for over moisture would rather enervate than strengthen them) but rather prepare the Earth the year before with such *insuccations*, and then hinder it from producing any weeds, till ready for the Kernels, and then in dewy times, [and more frequently when our Clime was furcharg'd with Rain,] cover the Beds and Pots with the small Leaves of *Rosemary*, *Gillyflowers*, or other odoriferous Blossoms, and repeat it often, to the end the Dews may *meteorize* and draw forth their finer Spirits, &c. Mr. Evelyn's *Pomona*.

36. *Another of altering the Colours of Flowers.*

For altering the Colours of Flowers by incisions; it has been given out by some, that Aris, and Bisle, and Verdigrase, those and such like may be dissolv'd betwixt the Bark and the Body of the *Carnation*, and that these mixt Colours, will cause a mixture in the Colour of the Flower. To this I answer, that this will never cause the effect, upon several Tryals that I have made. *Steven Blake, ubi supra.*

P A R A G R A P H XII.

*Experiments and Observations Historico-Terræcultural.*1. *Of a very large Mushroom.*

I Have seen a Mushroom (says my Author) near an Ell in compass, of less than two days growth; nay, the Owner in whose Garden it grew, affirmed it to be of one Night only. Mr. Worlidge's *Systema Agriculturae*.

2. *Of Cedar-Trees.*

Cedars grow plentifully on the Isthmus of *Darien*; also in *Jamaica*, upon Rocky Mountains; also the *Bermundus* Island are stor'd with them; and so is *Virginia*; which is generally a Sandy Soil. Also those of *St. Andreas* grow in Stony Ground; and their Bodies alone are 40 or 50 Foot long, and many 60 or 70, and upwards, and Bodies proportionable.

It is a mistake, that the Worm will not touch Cedar; for I have seen it very much Worm-eaten. *Dampier's Voyage round the World. Vol. 1.*

3. *Of the profit arising from the Planting of Apple-Trees.*

Apples Planted dispersedly about your Ground, either in the Hedges, or in Rows by the Hedges, raise a very considerable advantage at a very easy Rate or Charge, and that only in nursing them up till they are freed from common Injuries: The great advantages accruing thereby, are evident to the Inhabitants of *Herefordshire*, *Glostershire*, and several other Places in *England*.

I heard it certainly related in *Herefordshire* of a Tenant that bought the Living he then rented, only with the Benefit he made of the Fruit growing thereon in one year; with this advantage, that he utter'd his Cider by Retail, as they usually do Beer. Mr. Worlidge *ubi supra*.

4. *Another*

4. *Another of the same.*

I know (says Mr. Hartlib) that 10 or 15 pound an Acre has been given for Cherries, more for Pears and Apples; and besides, the Land it self, (whilst these Trees are small, and yield you not your desired gain,) is capable of bearing any sort of Tillage, till the Trees yield too much shadow; and then if they are not too thick, the Land is better than before it was Planted, sometimes to a threefold improvement, and has the Preheminency above other Pastures in being earlier, not subject to scorching Heats; and in the Winter there is plenty of Food for Sheep, &c. Mr. Hartlib's Legacy.

5. *Of the profits arising from the Planting of Pear-Trees.*

Next to Apples, the Pear challengeth his place: They will prosper in some sorts of Land where Apples will not, as in Stoney, Hungry, Gravelly Land; yea in a tough binding Hungry Clay; the Root of a Pear-Tree being it seems more able to pierce a stoney and stiff Ground.

The Pear-Tree bears almost his weight of Sprightful Windy Liquor; sometimes one Tree bears 2, 3, or 4 Hogs-Heads per Annum. In Herefordshire, I was credibly inform'd, that near Ross grows a Pear-Tree of that Magnitude, that the Circumference of the Body, or Stem of the Tree, was as much as three Men, from Hand to Hand, could beclip or fathom; that there was made in one year of the Fruit thereof seven Hogs-Heads of Perry. Mr. Worlidge, *ubi supra*.

6. *Of the profits arising from the Planting of Cherry-Trees.*

The Advantages of a Cherry Orchard are very great: Mr. Hartlib gives the Relation of a Cherry Orchard about Sittenburn in Kent, of thirty Acres, that produced Fruit in one year to the Value of above a Thousand pound; That President might be but once; one Swallow makes not a Summer; yet they are usually worth ten or fifteen pounds per Acre. Mr. Worlidge, *ubi supra*.

7. *Of Sowing Acorns.*

Oaks are in some places (where the Soil is specially qualified) ready to be cut for Cops in fourteen Years and sooner; I compute

I compute from the first *Semination* of the Acorn; tho' it be told as an instance of high encouragement (as indeed it merits) that a Lady in *Northamptonshire* Sowed *Acorns*, and liked to cut the Trees produc'd from them, twice in twenty two Years; and both as well grown as most are in sixteen or eighteen. This is certain, that *Acorns* set in Hedge-rows, have in thirty Years born a *Stem* of a Foot diameter. Mr. *Evelyn's Sylva*.

8. *Another of the same.*

It is a thing to be deplor'd, that some Persons bestow much in *grubing*, and dressing a few *Acres* which has been excellent Wood, to convert it into wretched *Pasture*, not worth a quarter of what the Trees would have yielded, well order'd, and left standing; since it is certain, that barren Land Planted with Wood will *treble* the *Expence* in a short time. This I am able to affirm by instancing in a *Noble Person*, who [a little before our unhappy Wars] having Sown three or four *Acres* with *Acorns*, the fourth Years *Transplanted* them [which grew too thick] all about his Lordship: These Trees are now (in 1663.) of that *stature*, and so like to prove excellent Timber, that they are already judg'd to be almost as much worth as the whole *Demesnes*; and yet they take off nothing from other profits, having been discreetly dispos'd of at the first designment.

The Prince *Electors Fredric IV*, in the Year 1606. Sow'd a part of that most barren Heath of *Lambertheim* with *Acorns*, after Plowing, as I have been inform'd; it is now like to prove a most goodly Forest, tho' all this while miserably neglected by reason of the Wars.

The Right Honorable my Lord *Viscount Montague* has Planted many thousands of *Oakes*, which I am told he draws out of *Copses*, big enough to defend themselves; and that with such success as has exceedingly improv'd his possessions; and it is a worthy example.

To conclude, I can shew an *Avenue* Planted to a House standing in a barren Park, the Soil a cold Clay; it consists totally of *Oakes*, one Hundred in Number: The Person who first set them (dying very lately) liv'd to see them spread their Branches 123 Foot in compass, which at the distance of 24 Foot mingling their shady tresses for above one thousand in length, form themselves into one of the most venerable and stately Arbour-walks that in my Life I ever beheld. This is at *Baynards* in *Surrey*, and belonging to my most honour'd Brother (because a most industrious Planter of Wood) *Richard Evelyn*, Esq; the walk is broad 56 Foot,
and

and one Tree with another containing by estimation three quarters of a Load of Timber in each Tree, and their tops three cord of fire-wood: Their Bodies are not of the tallest, having been top'd when they were young, to reduce them to an uniform height; yet is the Timber most excellent for its scantling, and for their Heads few in England excelling them. Where some of their Contemporaries Were Planted single in the Park without Cumber, they spread above four-score Foot in Arms. *Evelyn, ibidem.*

9. Of Planting Elms.

The *Vernacula* or Trench-Elm, delights in low and moist grounds, where they will sometimes rise to above a Hundred Foot high, and a prodigious growth, in less than an age; *My self having seen one* planted by the hand a Countess yet living, which is near twelve Foot in compass, and of a height proportionable; Notwithstanding the numerous progeny which grows under the shade of it, (some whereof are at least a foot in Diameter) that for want of being seasonably transplanted must need have hinder'd the procerity of their ample and indulgent Mother. *Mr. Evelyn, ibidem.*

10. Of Planting Abele-Trees

The finest sort of *White-poplars*, which the *Dutch* call Abele, (and we have much transported out of *Holland*) are best propagated of slips from the Root: In three Years they will come to an incredible altitude; in 12, be as big as your Middle; and in 18 or 20, arrive to their full perfection: A Specimen of this advance we have had of an Abele-Tree at *Sion*, which being lop'd in *February 1651.* did by the end of *October-1652.* produce Branches as big as a Mans Wrist, and seventeen foot in length; As they thus increase in bulk, their value, and price advance likewise; so as the *Dutch* look upon a Plantation of these Trees as an ample portion for a Daughter, and none of the least effects of their good Husbandry; which truly may very well be allow'd, if that calculation hold, which the Knight has asserted, who began his Plantation not long since about *Richmond*; that 30 pounds being laid out, in these Plants, would render at the least ten thousand pound in Eighteen Years: Every Tree affording thirty Plants, and ever of them thirty more, after each seven Years improving Twelve-pence in growth, till they arriv'd to their Acme. *Mr. Evelyn, ibidem.*

11. *Of Orange, and Lemon, or Citron-Trees, being grafted on one another; and of one individual Fruit, half Orange and half Lemon, growing on such Trees.*

We have here Orange-Trees, (says the Intelligence from *Florence*) that bear a Fruit, which is Citron on one side, and Orange on the other. They have not been brought hither out of other Countreys: And they are now much propagated by grafting.

This was lately confirm'd to us by a very ingenious *English* Gentleman, who asserted, that himself not only had seen, but bought of them, *An*, 1660. In *Paris*, whither they had been sent by *Genoa* Merchants; and that on some Trees he had found an Orange on one Branch, and a Lemon on another Branch; as also (consonant to the *Florentine* Information) one and the same Fruit, half Orange and half Lemon; and sometimes three quarters of one kind, and one quarter of the other. *Philos. Transact. Num.* 29.

C H A P.

C H A P. III.

Experiments and Observations
CONSERVATICAL.

BY Experiments and Observations Conservatical, I mean such as relate to the Preserving and Conser-
ving of Bodies in their natural (or at least in a useful)
state; whether they be Animal, Vegetable, or other Sub-
stances. This being premis'd, I proceed to Experiment or
Observation, the —

1. *Concerning the Preservation of Plants in their
Natural Shape and Colour.*

We find our selves much help'd to retain in our Memory the figures and difference of Vegetables, by those Books which some curious Botanists make, wherein the Plants themselves, artificially dri'd, are display'd upon, and fasten'd to, Leaves of White-Paper. If it were not for one of those books, wherein I have in one vast Volume almost all the Plants of one of the chief Physick-Gardens in *Eurp*, I should every Year forget, by the end of Winter, to know again most of the smaller Plants I had learn'd to take notice of in the Spring: And by the way 'tis observable, how long Plants, by being thus (carefully indeed, but) barely dried in the shade betwixt sheets of Paper, (which help to soak up the superfluous moisture,) may be preserv'd. For I have divers Years had an Herbal, wherein several of the Flowers, and other Plants, retain their native Yellow, and Blew, &c (But somewhat faint,) tho' by the Date it appear'd to be 22. or 23. Years old. *Boyl's usefulness of Exper. and Nat. Philos. part 2. Sec. 1. Essay 1.*

2. *Of preserving Insects, and other small Animals;
in their natural Shape and colour.*

I am apt to think, that it would be very possible for Anatomists to preserve the Bodies they contemplate a con-
siderable

sidrable time: For *Experience* has inform'd us, that Butter-Flies, and divers other Flying Insects, may have their Shape and Colours preserv'd, I know not how long, by running them through in some convenient part with pins, and there-with striking them to the inside of large Boxes. *Boyl ibidem.*

3. *Another of the same.*

I remember, that having sometimes reflected upon the lasting of Spiders, Flies, and other small Living-Creatures, that, having been casually enclosed in Amber whilst it was soft, are ever preserv'd entire and uncorrupted; I thought it not amiss to try whether some substance, like Amber (at least as to the newly mention'd use of it) might not easily be prepar'd by Art: and hereupon I quickly found, that by taking good clear Venice-Turpentine, and gently evaporating away about a third part of it, (sometimes more, sometimes less, according to the exigency of my particular purpose,) I could make a redish Gum, diaphanous and without Bubbles, and which would melt with a very gentle Heat, and easily (being suffer'd to cool) become again so hard as to be brittle. This resinous Substance should be melted with as little Heat as possible, (and therefore should be first powder'd) that the texture of the Vegetable or Animal Bodies to be cas'd over with it, might receive the lesser alteration: And when it is brought to the requisite degree of Fluidity, then the Body to to be preserv'd, (being, if that be needfull, struck through with a pin) must be gently plung'd into it, and presently taken out and suffer'd leisurely to cool, being turn'd from time to time this way or that, if there be occasion, that the investing matter may be every where of an equal thickness upon it. And if at the first time the case be not thick enough, it may again when it is cold, be immerst into the Liquid-matter, (as Chandlers are wont to thicken their Candles, by dipping them frequently into melted Tallow) of which some will every way adhere to it. And tho' these cases be inferior to Amber in regard of their being more apt to be sullied by the Dust, or otherwise; yet that inconvenience may be easily remedi'd, by keeping them shut up in Glasses or Boxes, at those times when one has not occasion to consider them. And their clearness (especially if they be thin) and their smooth Surfaces, together with their exactly keeping out the Air from the Body they inclose, may, perhaps, make so cheap and easy an *Experiment* a not unwelcome trifle, especially considering how easily 'tis capable of Improvement. *Boyl, ibidem.*

4. *Of preserving Humane [&c.] Bodies from Putrefaction.*

I have known an *Embrio*, (wherein the parts have been very perfectly delineated and distinguishable,) preserved unputrid for several Years, by being seasonably and artificially embalmed with Oyl (if I much misremember not) of Spike. *Boyl, ibidem.*

5. *Another of the same.*

Josephus Acosta, a sober Writer, relates, that in certain American Mountains, Men, and the Beasts they ride on, are sometimes kill'd by the Winds; which yet preserve them from Putrefaction, without any other help. *Boyl, ibidem.*

6. *Another of the same.*

Spirit of Wine has a notable balsamick Faculty, and powerfully resists Putrefaction, in Bodies, living and dead. And I remember that I have sometimes preserv'd in it some very soft parts of a Body for many Months, (and perhaps I might have done it for many Years, had I had opportunity) without finding that the consistence or shape was lost; much less, that they were either putrid or dry'd up.

Also I have for curiosity sake, with this Spirit, preserved (from further stinking) a portion of Fish, so stale, that it shined very vividly in the Dark. *Boyl. ibidem.*

7. *Of preserving Blood sweet and fluid.*

Also I have, have by mixing Spirits of Wine with Blood, very long preserv'd a quantity of it, so sweet and fluid, that it was wondred at by those that saw the *Experiment*. *Boyl, ibidem.*

8. *Of preserving Veins and Arteries (when empty'd of Blood) plump and unapt to shrink.*

Saccarum Saturni being dissolved often enough in Spirit of Vinegar, and the Liquor being each time drawn off again, we have observ'd to be apt to melt with the least Heat, and afterwards to grow quickly into a somewhat brittle consistence again: and therefore being melted, is very fit to be injected

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into Veins or Arteries (newly empty'd of Blood) to preserve
them plump and unapt to shrink overmuch. *Boyl, ibidem.*

9. *Of the way of Preserving Birch Water, and
other Liquors and Juices.*

Birch-water may be preserv'd, by pouring upon the top of it
a quantity of Sallet-Oyl, to defend it from the Air; and
perhaps also by Distillation: by which (last named) way, I
know an ingenious Man that is wont to preserve it, for his
own use, and says, he finds it not thereby impair'd in vertue.

But the most effectual way that ever I yet practis'd, to
preserve both this and other Liquors, and Juices, is dex-
trously and sufficiently to impregnate them with Fume of
Sulphur, which must be at divers and often times as it were,
incorporated with the Liquor, by due agitation. *Boyl's
usefulness of Exp. and Nat. Philos. part 2. Sec. 1. Essay 4.*

10. *Of preserving Bisket from putrefaction.*

'Tis a common *Observation*, that the Air doth much con-
tribute to the corruption of some Bodies, and the exclusion
of the Air to the hindring it. I remember the inquisitive
and Learned Mr. *Borreel*, assur'd some while since, that he
had in his Countrey, *Holland*, eaten Bisket that was yet good,
after it had been carried from *Amsterdam* to the *East-Indies*,
and brought back thence again (in which Voiage between
two or three Years are wont to be spent.) And to confirm
my conjecture of the way of preserving this Bread so long,
he told me, that the curious Merchant, whose it was, used no
other Art, than the stowing this Bisket, well baked, in casks
exactly calked; and besides carefully lin'd with Tin, for the
more perfect exclusion of the Air. Adding, that to the same
end the Biskets were so placed, as to leave as little room as
possibly might be in the cask, which also was not open'd, but
in case of absolute necessity, and then presently, and carefully
closed again. *Boyl, ibidem.*

11. *Of preserving Meats Roasted for long Voia-
ges, and that without Salt.*

It seems very difficult, as well as useful, to be able to pre-
serve Meat long, without Salt; for 'tis sufficiently known
to Navigators, how frequently in long Voyages, the Scurvy,
and other Diseases, are contracted by the want of fresh Meat,
and the necessity of feeding constantly upon none but strongly
powder'd Flesh, or Salted fish; and therefore he is much to
be

be commended that hath first devis'd the way to keep Flesh sweet, without the help of those fretting Salts Men are wont to use to make it keep.

And this way is not unknown to some ingenious Persons in *London*; one of the most noted of whom, upon my conjecturing how it may be perform'd, confess'd to me, that I had hit upon the way in general. But the most satisfactory account I could get, was from an *English*-man, that lately practis'd Physick in the *East-Indies*; who, finding I was no stranger to what I ask'd him about, told me freely, that he had seen both Goats-flesh, and Hens, so well preserv'd by this way, that tho' it were put up in the *East-Indies*; a while before he came thence, yet he eat of it, (and found it good and wholsom,) between the *Islands* of *Cape-Verd*, and *England*; so that this Meat continu'd sweet above six Months; notwithstanding the Heat and closeness of the Ship, the excessive Heat they met with in their passage under the Line, (and consequently through the *Torrid-Zone*,) and that the way to preserve it was only this.

That the Meat being well Roasted, and cut in pices, was carefully and conveniently ranged in a very close Cask, into which, afterwards, there was poured as much Butter melted, Skimmed, and decanted from the grosser and ranker parts, as would fill up all the intervals left between the several pieces of flesh, and swim above them all, and thereby keep out the Air from approaching them; and then the cask being exactly closed, was stowed in a convenient place in the Ship, and kept unopen'd till the Meat was to be eaten. And it must not be omitted, that the Relator. and others that had the care of making provision for the Voyage, were fain, instead of Butter made of Cows-Milk, (which could not be had where they took in their Lading) to make use of that made of Goats, or Ews-Milk, which is not as the *Indians* make it) so good, and to whose rankness he ascrib'd that which he had observ'd in some of the Meat bury'd in it, which he thought might have been preserved longer, and better tasted (for wholsom and incorrupt he said it was) in our European Butter, whose power to preserve Meat buried in it, after due coction, has been confirm'd to him upon their own *Observation*, by an *Experienc'd* Officer of the *English* Fleet, that had the oversight of the Provisions; and by others that had opportunity to observe it. *Boyl, ibidem.*

12. Of preserving Raw Meats.

I hope there will be ways found out to preserve even Raw Meat it self (for the keeping of Roasted, we have just now given you an instance) with things that do not so much fret it, nor give it so corrosive a quality, when eaten, as our

common Salt doth. For, (not to mention what several curious Persons have practis'd, of Salting Neats-Tongues with Salt-Peter; which tho' done only to make them look red, shews, that a Body, not corrosive like common-Salt may preserve flesh,) I have, for Tryal sake, kept an entire puppy of a pretty bigness, untainted for many Weeks, (and that in the midst of Summer) and that without slaying, drying (by Fire, or otherwise) or so much as exenterating him, or cleansing him, or doing any thing towards the preserving of him, save the keeping of him immersed in a well stop'd Vessel, under Spirit of Wine; from whose Taste, I presume, Meat may be easily freed by Water, and there seemed small cause to doubt that the only thing that hindred me from keeping him much longer, was the want of time to pursue the *Experiment*, and take notice of success. For I remember, I have the same way kept a soft substance, taken Raw from an Ox, or Cow, for many Months (if I mistake not, eighteen or twenty) and found no Putrifaction or ill sent in the immersed Substance; which, for ought I know, might have been preserved divers Years together the same way, or at least, by an easy improvement of this method. *Boyl, ibidem.*

13. *Of Conserving by Sugar, and making Sugar of other Concretes besides the Cane.*

If we reflect upon Sugar, which is (at least in these western Regions) but an almost recent Discovery; and consider how many Bodies are with it, (by Confectioners, and others,) not only preserved, but rendred exceeding grateful to the Taste; that single instance may suffice to make us think it probable, that Expedients yet unthought of, may, by an insight into Nature, be found out for the preservation of Bodies; especially, if our ingenious friend Mr. W. would shew us how, out of divers other Concretes, besides the Sugar Cane, a substance not unlike Sugar (tho' of different Taste, according to the nature of the Vegetables that affords it,) may by a peculiar Industry be prepar'd: Which, that you may not think unfeasable, let me mention to you (for perhaps he has not yet taken notice of it) what even *Indians* have done of this nature. And first, let me inform You of what we are told by *Linschoten* concerning that Drink which in the *East Indies* they call *Sura*, and made of the Liquor dropping from the Blossoms, that they cut away from the *Indian Palm-Tree*, which bears the *Coco-Nut*. For of this *Sura*, he tells us, they make Sugar, which they call *Jagra*,) by boyling that Liquor, and setting it in the Sun where it congeals to Sugar.

Since the writing of these last Lines, being Visited by an ancient Virtuoso, Governor to a considerable Colony in the
Northern

Northern America, and inquiring of him, (among other particulars touching his Countrey, something in relation to the thoughts I had about the making of several kinds of Sugar; he assur'd me, upon his own Experience, that there is in some parts of *New-England*, a kind of Tree, (so like our Wallnutt-Tree, that it is there so call'd;) whose Juice, that weeps out of its incision, &c. if it be permitted slowly to exhale away the superfluous moisture, doth congeal into a sweet and saccharine Substance.

And the like was confirm'd to me, upon his own Knowledge, by the Agent of the great and populous Colony of the *Masathusets*. And very lately demanding of a very eminent and skillful Planter, why, living in a part of America, too cold to bear Sugar-canes, he did not try to make Sugar of that very sweet Liquour, which the Stalk of *Maiz*, by many call'd *Indian-Wheat*,) affords, when the juice is exprest? He promis'd he would make Trial of it: Adding, that he should do it very hopefully, because that tho' he had never been solicitous to bring this Juice into a saccharine form; yet having several times, for Trial sake, boyl'd it up to a Syrup, and employ'd it, to sweeten Tarts, and other things, the Guests could not perceive, that they were otherwise sweeten'd than with Sugar. And he further added, that both he and others had, in *New-England*, made such a Syrup of the juice of Water-Melons. *Boyl, ibidem.*

14. Of the way of preserving Liquors, Juices, &c.

These things may be preserved, not only much better, but much cheaper, than with *Sugar*; which clogs most men's Stomacks, and otherwise disagrees with many constitutions;) by the bare fuming them with Sulphur. And this is an excellent way of keeping them uncorrupted; provided, that they are 6 or 7 several times (seldomer or oftener, according to the quantity of the Liquor) well impregnated with that embalming Smoak; to which purpose it is convenient to have two Vessels, to pour it from one to the other, that whilst the Liquor is shaking in the one, the other may be fill'd with Smoak: whereto I shall subjoyn this Secret, which a *Friend of mine* practices, in preserving of the fumigated Juices of Herbs (as I do to preserve other things) with a success that I have somewhat wonder'd at; and this secret consists, in adding to the Liquor to be preserv'd, a due, but small proportion of the white *coagulum*, made of the pure Spirits of Wine and Urine. *Boyl, ibidem.*

15. *Of the manner how to Conserve Fruits in their Natural State.*

There is nothing which does more agreeably concern the Senses, than in the depth of Winter to behold the Fruit so fair, and so good, yea better, than when you first gather'd them; and that then, when the Trees seem to be dead, and have lost all their verdure, and the rigour of the cold to have despoil'd your Garden of all that imbellish'd it, that it appears rather a Desert than a Paradise of Delicacies: then it is (I say) that you will taste your Fruit with infinitely more gust and contentment than in the Summer it self, when their abundance, and variety, rather cloy you, than become agreeable. For this reason therefore it is, that we will essay to teach you the most expedite, and certain means to conserve them all the Winter, even so long, as till the new shall incite you to quit the old, for its just with Fruits as it is with Wines; those which we drink first are the more delicate and juicy, and those which we receive for the latter part of the Year, are more firm and lasting; both excellent in their Season: But so soon as the new are made, and fit to pierce, we abandon the old, which we before esteem'd so acceptable. In the like manner it is, so soon as the new Fruits approach to their maturity, we forsake those of the Year past; and one dish of Strawberries, or Cherries, (tho' never so green) or forward Pears, shall be prefer'd to the best, and fairest Bon-chrestien which you can produce.

To come then to the Matter in hand. It will be necessary to choose some place in your House, the most commodious to make your *Reservatory* or *Store-house*, which should have the Windows and Overtures narrow, to prevent the extremity both of the *Heat* and *Cold*: and these you should always keep shut, and so secur'd from the Air, as only to afford you a moderate Light, which you shall also banish, by closing the Wooden Shutters when you go out: And indeed were there none at all, and that the Door to it were very straight, and low, it would be the better.

Such a place designed for your *Store*, you shall build Shelves about it, and (if the Room be capable of it) let the middle be to lay *Fruit*, (*viz.* Such as are the most common, and destin'd for the Servants,) in Heaps. But if the Room be not wide enough, it shall suffice to shelve three sides of it, and leave the fourth for the Heaps.

Let your shelves be laid upon Brackets of Wood or Iron very strong because of their great Charge. Let them be two foot broad, and ledged with a lath, to keep the Fruit from rowling, and falling off: But let none of these shelves be within a Yard of the Floor, that you may place the best rare Fruit under them.

them, separating, and distinguishing them according to their kinds; but you may continue the shelves upwards to the very cieling, placing them about nine or ten Inches asunder. And for the greater conveniency, you may have a small light frame of steps, by which to ascend and reach (even) to the uppermost shelf, when you would visit your Fruit; a ladder being nothing near so, convenient; wearying the Feet, and more subject to fall.

The Season of gathering your Winter Fruits, being come, which you shall discover by many indications; as when they begin to drop off, of themselves; which commonly happens after the first Rains in Autumn, when the Trees being fobb'd and wet, swells the Wood, and loosens the Fruit: Or when the first Frosts advertise you that it is time to lay them up: or (to be more certain) at the decrease of the Moon in *October* (thus for *Pears* and *Apples*) beginning to gather the *softest* first, and finishing with the *harder*, that they may have the more time to perfect their maturity.

There are some *Fruits* that are only to be eaten ripe, as the *Grosvenor Pear*, *Cormes*, *Servises*, *Azerolls* and the like, which you shall leave upon the Tree, till you perceive by their falling in great number, they admonish you to gather them.

Medlars are to be gather'd about *St. Luke's Day*, according to the Proverb.

When you gather your *Fruits*, you ought to be provided with strong Ozyer Baskets, and to put a little Straw at the bottom of them, least the weight of the uppermost bruise the undermost against the Basket.

And as you gather your *Fruits*, separate the fairest, and biggest from the midling ones, and such as are fallen off, of themselves, or that have been dropped down in gathering the others, putting each sort in a Basket by themselves: I speak not here of the smallest, and the *Crumplings*, for I suppose you discharg'd your Trees of them before, so soon as you perceiv'd that they did not thrive, to give the more nourishment to the rest. The *Worm-eaten Apples* should also be put amongst those which are fallen, to be spent first.

As fast as you gather your Fruits, carry them into your *Store-house*, and range them upon your Shelves, so as they may not touch one another, putting a little Straw under them; and in like manner distinguish the fairest and biggest, from the lesser upon several Shelves, and heaping up the *worm-eaten* and *fallen*, as I but now directed.

As for the *Bon-Chrestien Pears*, they are more curiously to be gather'd than the rest; for the Stalks of such as are very fair, and well colour'd, (*Red* at one side, and *Yellow* at the other,) should be seal'd with *Spanish Wax*, to preserve their Sap from evaporating: this done, wrap them up in dry papers,

papers, and put them in a Box close cover'd, that they may grow tawny and mature being thus shut up.

In the same manner order the *Double-flower Pear*, the *Troul*, and others that are grafted upon the *Quince*, and which receive their colour from the Tree: But as for those that are grafted upon the *Pear-stock*, they commonly continue green, and therefore without any farther trouble, you need only range them upon the Shelves, as you did the rest.

Those that are very curious have a cupboard, which shuts very close, in which they reserve their *Bonne-Chrestiens*: This cupboard is furnished with Shelves made of small quarters of Wood, laid a cross like a Grate, every Square being near as big as the greatest Pear, upon each of these Squares they lay a Pear by it self, for fear lest they should touch; and that if any of them should be perished, it do not infect its neighbour.

This Cupboard they keep very close, pasting pieces of Paper over all the Chinks, (even that of the Key-hole) to keep out the Air; and never open it, but when they would take out Fruit: And this closing them up, does give them a most excellent colour: But before they thus shut them up, they leave them five or six days in the Baskets wherein they were brought out of the Orchard, that they may have time to sweat.

Those Fruits that are to be eaten Ripe, should be lay'd in Heaps; and if they do not mellow fast enough to your desire, put them into a Wheat-sack, and jumble them well together; concussion one against another, will exceedingly advance their maturity.

Your *Muscat-Grapes* of all colours, (as the *Chasselats Bicané*, and *Rochel-Grapes*, or others more ordinary,) are to be preserv'd several ways, either singly ranging them upon Straw, or hanging them in Sieves up to the cieling, covering them over with paper to guard them from the Dust, or Barrelling thew up with Oat-chaff, or in a Tub of Ashes, or which is best, hanging them by their Ends (not Stalks) in your foremention'd Cupboard.

There are several other ways of keeping Grapes, as when they are in Flower, to put the cluster into a Glass-vial, and when it is ripe cut it from the Vine, and seal up the Stalk; but it must so hang, as that none of them touch the side of the Glass, and then close the mouth of it with soft Wax, to keep out the Air, this will preserve the cluster till Christmas. There are divers other ways which I omit; because they are either unprofitable, troublesome, or expensive.

16. Of preserving Fruit by drying it.

There are divers Fruits that we dry in Ovens which in hotter Countreys they dry in the Sun; as in *Provence*, the *Prunella's*; in *Languedock*, *Raisins of the Sun*; but since the cold of our Climate obliges us to make use of the Oven I will here describe in particular, how each of them ought to be dry'd.

Beginning then with *Cherries*, *White*, *Hearts*, and preserving *Cherries*, as with the first which the Season presents us. Chuse such as are very ripe, fair, fresh, and not bruised: You shall spread them upon Lattices, or Hurdles made of Wicker, ranging them one by another, as handsomely as you can, without suffering them to lie one upon another, with their Stones and Stalkes; then put them into the Oven, which must be of a temperate Heat, such as usually is after the Household Bread is drawn. And having left them as long as any Heat remains; take them forth, and turn them, that they may be perfectly dry: After this, Heat the Oven again, putting them in as before; repeating this course till they are sufficiently dry'd to be kept; then let them cool in heaps a whole day, and afterwards binding them up in small bunches, reserve them in Boxes, exquisitely shut up.

Plums are to be dry'd like *Cherries*, very ripe gather'd; the best for this purpose are such as are fallen off the Trees, for they are most Flethy, and will be more agreeable to eat, than those you shall gather, which retain always some Verdure upon them,

The very best are to be chosen to dry, as the *Imperial*, *Date*, *St. Catherien*, *Diap*, *Perdrigon*, *Cytrons*, *Prunella's* *Mirabolon*, *Roche-borbon*, *Damasks* of all sorts, and the *St. Julian* for ordinary spending.

If you desire to counterfeit *Prunella's*, you must make choice of the fairest of your *Plums*, as the *Perdrigon*, the *Abricot-Plum*, *Egg-yolk*, *Brignolles*, or others which have a white Skin, peel them without a Knife, drawing them by the Skin, which will easily quit the *Plum*, if it be thoroughly ripe, then Stone them without breaking the Fruit, as I shall hereafter instruct you when I speak of *Abricots*. Boyl the Skins well, with a little Water, and strain it through a Cloath, and in this juice (which should be in the consistency of a Syrup) infuse your *Plums*: as often as you set them into the Oven, flattening them every time: If your Liquor be not thick enough, you shall add to it the juice of *White Corinths*, very ripe, which will render you Syrup sufficiently consistent. You may also (if you please) add some Sugar to them; for so they will be excellent, and require less drying.

As for the *Provencals*, instead of setting them in an Oven, stick them upon Thorn branches, and so leave them to dry in the Sun.

Peaches,

Peaches, are to be order'd in the same manner as *Plums*, excepting, that they must be gather'd from the Tree; for those which fall (besides that they will be over ripe, they) will have such Bruises, as will hinder their drying, without great trouble; and will be very disagreeable to the taste. Before you Stone them, you must set them once in the Oven to mortifye them: afterwards slit them neatly with a Knife, and take out the Stones; then open and flat them upon some Table, that when you set them in the Oven, they may be dry'd as well within as without; which otherwise, by reason of their great thickness, would not be done; and the last time you draw them out of the Oven, (whilst they are yet hot) close them again, and flatten them, to reduce them to their natural shape.

Abricots are also to be gather'd ripe from the Tree; you need not open them, to take out their Stones; but thrust them out (dextrously) near the Stalk: Neither in drying them need you open them like *Peaches*; but leave them whole, and only flattening them, that they may be equal in every part, and be the more commodious to range in Boxes.

If you desire to have them excellent, put a Pill of Sugar, about the quantity of a Pea, in the place of the Stone, and fill an earthen Milk-tray with them, covering it with a Lid of paste closed thereto: Then set it in the Oven, as soon as the Bread has taken colour; and there let it remain till it be cold; after which set it in the Stove upon *Slates*, as they dry *Sweet-Meats*; and when they are sufficiently dry to keep, and whilst they are yet warm, strew some finely searsed Sugar upon them, and leave them two days before you set them up.

Pears may be dryed *pared* or *unpared*, in the same manner as I shew'd you before of the *Plums*; but being *pared* they are much more delicate, and the parings are to be us'd, to infuse in the Liquor, as I taught you in *Plums*. You must leave their *Stalks*, and the *Crown* when you pare them, choosing such Fruit as is the fairest, most delicate, and full of Flavour, as the *Orange-pear*, *Summer Bon-chrestien*, *Muscadelle*, *Roussel*, *Great Muscat-pear*, &c.

You may put of these likewise in earthen Pots, with their Skins upon the Fruit, before you cover them with Paste; thus dry, and strew them, as you did your *Abricots*.

The *Pear* is not to be gather'd over ripe, for that will render it flashy,

In *Grape-time*, you may infuse the Parings in new *White-wine*, instead of Water; or in *Cyder-time*, in new *Perry* made without Water.

Apples are commonly dry'd without parting them, and are to be slit in the midst, taking out the Core: some of them you may boyl for Liquor, to soak those in, which you intend to dry.

Grapes of all sorts, *Muscadine*, and others, are to be dry'd in the *Oven*, upon the *Hurdle*, without farther trouble, than only to dry them in a temperate *Heat*, and turn them frequently that they may be dry equally. Those of *Languedoc* pass them through a *Lye* before they dry them in the *Sun*; and this they say preserves them from *Worms*.

Amongst *dry Fruits*, I will also range *green Beans*, which being well dress'd with a little *Winter Savory* dry'd (the true seasoning of *Beans*) may pass for new.

To dry them, you must take those that are tender, and which yet have their *Skins* green, before they are white, take off this coat, (that is, peel them, then dry them in the *Sun*, upon papers, often turning them daily; at *Evening* bring them in and expose them again to the *Sun* every day, till you find them very dry, which will soon be, if it be not close weather: being dry, you may keep them cover'd in *Boxes*, carefully preserving them from all *Moisture*.

For *green Pease*, chuse the youngest which shalle out of their *cods*, and dry as you did the *Beans*, and infuse them likewise in warm *Water* before you boyl them, adding to the *Liquor* a handfull of the leaves of *new Pease*, if you have any green, tying them in a *Bunch*, least they mingle with your *Pease*.

Morilles and *Mushrooms* are to be filed on a *Thread*, and hung up in some hot place, as over an *Oven*, where they will easily dry; or if the place be commodious for it, before the *Fire*; or set it into the *Oven* it self temperately Warm.

17. Of preserving Fruits by pickling them with Salt and Vinegar.

Cucumbers are the biggest *Garden Fruit* which we use to pickle; they are to be chosen very small, which they call *Gerkins* or *Cornets*, because we choose those which resemble little crooked *Horns*, and that do not improve; or else somewhat bigger, but very young, before their *Seed* be hard, which are nothing so pleasant to eat: These are to be pickl'd, pared or whole; but it is better to pare them before you put them in pickle, than afterwards, because of the loss of your *Salt* and *Vinegar* upon the *Skin*, which will become so hard, as scarcely to be eaten: But they are handsome, and whiter, being pared at that instant when you serve them to the *Table*, than such as you pare before they are pickl'd: so that you may do which of them you please.

The other small *Horn'd Cucumbers* are to be pickl'd without paring, by reason of the delicateness of their *Skin*.

You must gather them very early in the *Morning*, and let them lie the rest of the day in the *Sun*, to mortify them a little, that they may better receive the *Salt*.

Put the *pared*, the *unpared*, and the *Gerkins*, each of these in well glazed Earthen Pots a part (for those that are unglazed, crumble and moulder away, by reason of the Salt which penetrates them, and so lose their pickle) ranging them handsomely, and crowding them as near as you can to one another, without bruising: then strew a good quantity of Salt upon them, and the Vinegar afterwards, till the uppermost of all are well cover'd; otherwise there will breed a Mouldiness, that will spoil all that remain bare. Thus set them up in a temperate place, and touch them not at least in six Weeks, that they may be perfectly pickl'd. Your Store-house (mention'd *Num.* 15.) will be the most convenient place to keep them in.

Let the *Purslain* which you would pickle, be of that you have transplanted, that it may be the fairer. The true season to gather it, is, when it begins to flower, if you would have that which is tender: For if you omit it till it be out of flower, that you may save the Seed, (as it is commonly sold) it will be too hard to eat. Let it also be dry'd and mortif'd in the Sun, two or three days, and then range it in glazed pots with Vinegar, and Salt, as you did in Cucumbers.

Capers, *Broom-buds*, *Sampier*, *Tarragon*, and the like, are to be pickl'd after the same manner as above.

Bottoms of *Artichokes* are to be pickl'd in Salt, but after a different method from the former; for they must first be above half boyl'd, and when they are cold, and well drain'd of their Water, (they should likewise be well dry'd with a Cloath, to take out all their Humidity,) range them in Pots, and your Brine upon them, as strong as it can possibly be made; which is done by putting into it so much Salt, as, till it will no longer imbibe it, and that the Salt precipitates to the Bottom whole, and without melting. This we call *Marinated Water*.

Upon this Water (which must cover your *Artichokes*) pour sweet Butter melted, to the height of two Fingers, that you may thereby exclude the Air; then, the Butter being cold set up the Pot in some temperate place (as you did your Cucumbers) cover'd, and well secur'd from Cats and Mice, which else will make bold to visit your Butter.

But I presume that before you put the *Artichokes* in the Pot, you did prepare them, as you would have done to serve them to the Table, that is, taken off all the Leaves, and the Choke, which is within.

The true Season for this is in Autumn, when your Plants produce those which are young and tender; for these you shall take to pickle, before they come to open and flower, but yet not till their Heads are well form'd and hard,

When you would eat of them, you must extract their Saltiness by often shifting the Water, and boyling them once again, before you serve them at the Table.

Asparagus

Asparagus, *Pease* without *cods*, *Morilles*, *Champignons*, or *Mushrooms*, are also to be pickl'd in Salt, having first par-boyl'd them, and prepared every sort in its kind, after the same manner as you did *Artichocks*.

You should before Monthly to visit your Pots, that in case you perceive any of them mouldy, or to have lost their pickle, you may accordingly repair them.

I have some Years since invented the pickling of *Cornelians*, and have frequently made them pass for *Olives* of *Verons*, with divers Persons, who have been deceiv'd, their colour so resembling them, in their taste so little different. To effect this, I cause the fairest, and the biggest to be gathered, when first they begin to blush, and then letting them lie a while, I Pot, or Barrel them up, filling them with *Brine*, just as I do *Artichocks*; and to render them odoriferous, I add a little Branch of green *Fennel*, and a few Bay-leaves: then closing the Vessel well, I touch it not for a Month after. If I find them too Salt, I dilute and abate the pickle, before I serve them to the Table.

18. Of preserving Fruits with Wines, in Must, in Cyder, or in Honey

All sorts of Fruits which may be preserv'd in Sugar, may also be preserv'd in *Must*, in *Cyder*, or in *Honey*. And there is no other difficulty in making choice of Fruits to scald and preserve this way, than in chusing such as you would preserve in Sugar.

I shall here describe the principal Rules, which must of necessity be observed in preserving Fruit in *Must*, or New-Wine. Take therefore of *Must* a sufficient quantity, according to the quality of the Fruit which you intend to preserve: set in a Kettle or Skiller on the Fire, but with care, that if your Fire be of Wood, the Flame being too great, do not burn some side of the Vessel. Then let your *Must* continue boyl'ing till it be reduc'd to a third part, that it may be of a fitting consistence to preserve your Fruit in sufficiently, and keep it from moulding and spoiling.

The Fruit being pared, or unpared, according to their natures, or your curiosity, those which ought to be scalded being done, well drained, and dry'd from their water, are to be put, and preserved in this *Must* carefully scum'd, and made to boyl, till you perceive the Syrup to be of a sufficient consistence, which you may know by dropping some of it upon a Plate, for if it appear in stiff Rubies, and run not about the Plate, a little inclined, it is thick enough.

You cannot take your *Must* too New, and therefore, as soon as you perceive the Grapes very ripe, tread them immediately, and take of that *Must* as much as will serve, *White*
or

or *Red*, according to the Fruit you would preserve. Some Fruits, as *Quince*, the *Pear*, and the *Blew-grapes*, &c. require *Must* of *Blew-grapes*; others of *White*, as *Walnuts*, the *Muscat-Grape*, and the like, whose candor and whiteness you would preserve.

To heighten the taste of those Fruits which you ought to preserve in *Red-wine*, put in a little *Cinnamon* and *Cloves*, ty'd up in a bottom of *Lawn*, that they may not be dispers'd among the Preserves, nor lost or consum'd in the Syrup; and to those which require *White-wine*, put a bunch of green *Fennel*, bound up likewise in a Cloath.

Codiniac, or *Marmalad* of *Grapes*, is made of the fairest and ripest *Blew Grapes*, gathered in the Afternoon at the Heat of the Day, to the end that their Moisture may be intirely dry'd up: Lay them in some Chamber of your House, where both the Air and Sun have free intercourse, spreading them upon Tables or Hurdles, that, (for at least a fortnight) they may there sweat and shrink. In case the Weather prove cloudy, or that the Season prove Cold, you may set them in your Oven, temperately Warm; after which press them well with your Hands, cleansing them from all their Seeds and Stalks, putting their Husks and juice to boyl in the Kettle, and dilligently scumming, and clearing it from the Seeds: Reduce this Liquor to a third part, diminishing the Fire, according as your confection thickness, and stirring it often about with your Spattle or Spoon, to prevent its cleaving to the Vessel, and that it may boyl equally: Being thus prepar'd, you shall percolate it through a Sieve or coarse Cloath, bruising the Husks with your Wooden Ladle, the better to expresse the Substance, and then wring it forth, or squeeze it in a Press: When this is done, set it again on the Fire, and boyl it once more, keeping it continually stirring till you conceive to be sufficiently boyled; then take it off, and pour it into Earthen Pans, to prevent its contracting any ill imack from the Kettle; and being half cold, put it into Gally-Pots to keep.

You must let your Pots stand open five or six days, and then cover them with paper, so fitted, as to lye upon the Preserve within the Pot; and when visiting your Pots, you find that any of your paper is mouldy, take it away, and apply another; this do as long as you shall see cause, which will be till such time as all the superfluous Humidity is vapored; for then the mouldiness will vanish, unless your Confection was not sufficiently boyl'd, in which case it must be boyl'd again, and then you may cover them for altogether.

To make *Mustard A-la-mode de Dijon*, you shall also take of this *Codiniack* and put to it store of *Seneve*, or *Mustard-Seed*, well bruised in a Mortar with Water, and finely searced; and when it is exquisitely mixt together, quench therein some live Coals, to extract all the bitterness of the Seed; then
either

either Barrel, or Pot it up, well closed, and reserved for use.

You may also preserve all sorts of Fruit in *Perrey* that has not been diluted, reducing it in boyling also to a third part, as we shew'd you in the *Must*. Lastly,

To preserve in Honey, you must take that which is most thick hard, and most resembling Sugar, boiling it in a Preserving Pan, scumming it exactly, and stirring it about, to preserve it from burning.

You may know when it is boil'd enough, by putting into it a Hens Egg; for if it sink, it is not yet enough; if it float, it is of sufficient consistence to preserve your *Fruits*. You know that Honey is very subject to burn, and therefore finish this Preparation upon a gentle Fire, frequently stirring to the bottom of your Pan with the Spatula, to prevent this Accident.

19. *Of preserving Parsneps, Carrots, and Beets, all the Winter for Eating.*

A little before the Frosts, draw your red Beets or Roman Parsneps out of the Ground, and lay them in the House, burying their Roots in the Sand to the neck of the Plant; and ranging them one by another somewhat shelving; and thus another bed of Sand, and another of Beets, and so continuing this order to the last. After this manner they will keep very fresh; spend them as you have occasion, and as they stand, and not drawing any of them out of the middle or sides for choice.

Carrots and *Parsneps* may be preserved all the Winter for spending, in the very same manner as you did the *Beets*.

20. *Of preserving Turneps for spending in the Winter.*

To preserve *Turneps* for spending in the Winter, you need only to House them in your Cellar, or some other place, where they may be exempt from the Frost, and that without any other trouble, save only laying them in Heaps, or Bunches. These six last Observations, out of the *French Gardiner*, a Book which Esq; *Evelyn* (Fellow of the Royal Society) commends as the very best of its kind.

21. *Of preserving Gooseberries all the Year to make Tarts of.*

A Friend of mine, that had a great many Gooseberries growing in her Garden, used to *preserve* many of them all the Winter, for the making of Tarts; and this she did by very easy Methods, as she her self told me, and as I have some times seen her perform it my self. She has two Methods of preserving them; and some time, she uses the one, and sometimes the other.

One of her ways was thus; when she thought the Gooseberries had their full growth, (but before they were ripe,) she gather'd them, (in a fair Day, when they were through dry,) and picking off their Eyes and Strings, she put them into (your common quart) Glass-bottles; (made very clean and dry) every now and then shaking the Bottles to make the Gooseberries lye the closer together; and so having fill'd each Bottle as full as she could, she scalded them (for the space of an Hour, or more) in Balaneo: That is, the Bottles being fill'd with Gooseberries, and stop't very close with a Cork, and a piece of Leather ty'd over their Noses; she took them (two or three at a time, or as many as she could) and put them into a Kettle of cold Water; (so that their Noses did but just stand above the Surface of the Water) this Water she hung over the Fire till it was scalding-hot; but taking great care that the Water were not too hot, for then the Bottles would be apt to crack. Then when she thought the Gooseberries were scalded enough; (which she knew by lifting a Bottle out of the Water, and seeing if they look'd White like scalded Gooseberries) she hung the Kettle back farther from the Fire, letting it cool by degrees, for fear of breaking the Bottles; and when it was perfectly cold, she took out her Bottles; wiping them with a Cloath; (and taking off the Leathers) and setting them at some distance from the Fire, (for a small time) to dry; then (seeing that they were stop't very close with their Corks) she took them and set them, in a cool and dry Room, there to stand till the Winter, when she had occasion for them.

This scalding of them will make them shrink or sink nearer together; and therefore some (that I know) will open the Bottles, (when they are scalded) and empty one or two of them to fill up the rest.

Her other way was only to take the Gooseberries, (in the above mention'd season) and without any more Ceremonies, she fill'd her Bottles, (as above was shew'd how) and stopping them close with a Cork, she set them by for her use in the Winter. And this way she thought did preserve them as well as the other.

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By either of these ways she preserv'd Gooseberries, (for the making of Tarts) all the Winter, even till Gooseberries came again; for at Whisuntide she has made Tarts, [of the precedent Year's Gooseberries, thus preserv'd] which my self have tasted, and could not distinguish them from Tarts made of Gooseberries newly gather'd from the Bushes.

When she had occasion to make Tarts, she only took her Gooseberries [if preserv'd by the fairest of these ways] and put them out of the Bottles into the Pies: But if they were preserv'd raw; then she used to scald them a little before she put them into her Pies. *Per Authorem.*

22. *Of preserving Water sweet and sound along time.*

My Author, being speaking of Salt, says, Salt being of a hot and dry nature, and by solution being very apt to incorporate with Water, consumeth all the putrid Vapors, or parts thereof, and correcteth all the putrefaction which it findeth, and so makes all good Waters to keep sweet and sound the longer. *For the Mariners themselves can witness that such Waters as be somewhat brackish, be best for long Voyages, because they will last longer than others: and therefore do often water their Ships from Springs that be near the Sea. Sir Hugh Plat's Jewel-house of Art and Nature.*

23. *Another of the same.*

Fresh Water may be a long time defended from putrefaction, only by addition of some small proportion of the Oyl of Sulphur with it, incorporating them both together, whereof I have long since made sufficient Tryal. Some commend the Oyl of Vitriol to the same end: And seeing my Pen has slippt into the Watery Element, I'll make the Seamen little beholding to me at their first Watering, which being spent, I must leave them to their brackish Waters again, unless by the help of some distillatory Vessel [wherein, as also in divers others of the same kind and quality, I have found Master Sergeant Gowthorpe, the most exquisite and painful practitioner and performer of our times] they can make separation of the fresh part thereof on Ship-board.

Let the Owner, Marchant or Mariner, [having sufficient leisure to make his provisions of fresh Water, before he begin his Voyage] prepare his water in this manner. First let him fill either some Rhenish-wine Fats, Sack, Buts, or White-wine Pipes, [such as have been saw'd through the midst] only with fair Water; and these half Tubs having Tap-holes within three Inches of the Bottom, at the which

after the Water has pass'd its first putrification, and is become sweet again] he may then draw it from its residence into a clean Cask; and by this means it will last much longer at Sea than otherwise; and yet if there were put two or three handfulls of Salt dissolved in a pipe of the same Water [which would not much offend either the Taste or Stomach] it wou'd preserve it much more than the bare preportion of the Water will do in the aforesaid manner. Sir *Hugh Plat*, *ibidem*.

24. *Another of the same.*

Sir *Francis Drake* [that *Spanish Scourge*, and *magna Spes altera Trojæ*,] who has sought for all the helps which he might, either in his Water or in his Victuals, for the better comfort and relief of his Mariners: in one of the last conferences which I had with him, did assure me, that the most putrifi'd and offensive Water that could happen at the Sea, would by 24 Hour's agitation, or rowling up and down, become sweet and good Beverage.

And Captain *Plat*, [in whom Sir *Francis Drake* for his good parts did always repose great trust and confidence,] did usually carry certain long and thick pieces of Sheet-Lead with him, which he would cause to be hanged by Lines, at the Bung-hole, even to the very centre of the Vessel, whereby he did attract much of the feculent part of the Water, and the Leads would become very slimy therewith. This he did with often change and iteration, always cleansing the Leads as they grew filthy, and so he found the Water a great deal more pleasing than before. Sir *Hugh Plat*, *ibidem*.

25. *Of preserving ripe Cherries for two Months, or more.*

Now methinks [says my Author] I see a whole troop of gallant Dames attending with their listening Ears, or [rather longing with their great Bellies] to learn some new found Skill, how they may play at Chop-cherry, when Cherry time is past. Well; to give these Ladies some content, I'll unfold a Scroll which I had long since as carefully wrap'd up as ever any of the Sybils their fatal Prophecies, wherein I will make them as cunning as my self [saving only that I will reserve one strange Vertue to foil a Scholar withal, if need be] the Secret is short; let one Element be included within another, so as the one may have no access to, nor participate with the other. But this [Peradventure] is too Philosophical for Women. Then receive it Ladies with plain terms into your open Laps.

For want of glasses with broad Skirts [whereof notwithstanding I do think there are enough to be had, if you can be so gracious with Mr. *Jacob* of the Glass-house] cause Pewter Vessels of some large content to be made, and of the fashion of Bell-saltcellars, with divers Eyes or Hooks on the inside, at which you must fasten the Cherries, by their Stalks, and hang them so as not to touch one another; the Skirts of these Vessels you must compass with Leaden Rings of such weight as may be able to press them down to the bottom of some leaded Pan, wherein you must place them, having first fill'd the Pan almost full with fair Water prepar'd as is set down *Num. 5.* [Says my Author: which *Num.* is here inserted in the precedent observation of this Chap.] lest by putrification of the Water, the Cherries also begin to putrify with it. Yet here you must be carefull that the Cherries hang within the Air of the inner Vessel, not touching the Water, which may haply rise one Inch, or somewhat more, within the innermost Skirts of them. And thus the Air being kept cool, and defended from change [whose alteration from heat to cold, and from moisture to driness, is the principal means of the ruining of all mortal Bodies] will preserve such Cherries as it receiveth in charge for two whole Months at the least, *as I have long since proved.* And perhaps if you make choice of sound Fruit gather'd after two or three fair days together, the dew being sufficiently drawn from them by the Sun, you may yet keep them somewhat longer. But the only pleasure of this secret is performed in glasses, through whose perspicuity, [after some reasonable quantity of water, first removed or divided] one may discern weekly in what plight they are. *Sir Hugh Plat, ibidem.*

26. *Of preserving any Fowl, or other piece of flesh, sound and sweet, for three Weeks or a whole Month together, notwithstanding the contagiousness of the Weather.*

Make a strong Brine so as the Water be over glutted with Salt, and being scalding hot, parboil therein the Fowl or Flesh which you would preserve some reasonable time, *viz.* According to the greatness and grossness thereof, then hang it up in a convenient place, and it will last a sufficient time without any bad or over saltish taste, *as I can testify upon my own Experience.*

This I thought good to publish, both for the better preservation of Mutton, Veal, and Venison, whereof a great deal in this Land is yearly lost, in hot and unseasonable Summers; as also for the benefit of our *English* Mariners, which are forced sometimes to victual themselves in such intemperate climates, where no *Flesh* will last sweet 24 Hours together

by reason they have no means to make it take Salt, which without all question will enter this way, and make penetration very speedily, by reason of the hot and fiery Spirit of Salt thus prepared.

Some do use to parboil their Fowl, after they have taken out the Garbage, and then they dip them in Barrow's Grease, or in Clarify'd Butter, till they have gotten a new garment over them, and then they lay them one by one in Stone-pots filling the Stone-pots up to the brim with Barrow Grease or Clarify'd Butter, wherein they do prick some Cloves, and sprinkle dried Salt upon the upermost face thereof, placing the Pots in some cool Room.

Some think that Fowl fill'd full of good Wheat, and and afterwards bury'd all over in Wheat, will keep good a long time.

I have also heard it very credibly reported, that a Side of Venison has been kept sound and sweet a whole Month, by lapping it in a thin Cloath, and then covering it with Bay-Salt. Sir Hugh Plat, *ibidem*.

27. *Of preserving Roasted Beef a long time sweet and wholesome.*

This may be done [says my Author] by putting the Beef into Wine-Vinegar, and Barrelling it up very close and well; and 'tis good that your pieces of Beef be not over great. *This secret was fully prov'd in that honourable Voyage to Cales.* Sir Hugh Plat's Closet for Ladies and Gentlemen.

28. *Of preserving powder'd Beef for the space of two or three Months, without change.*

When your Beef has been well and thoughtly powder'd for ten or twelve days space; then seeth or boyl it throughly; dry it with a Cloath; and wrap it in dry Cloaths; placing the same in close Vessels and Cupboards; and so it will keep sweet and sound two or three Months, *as I am credibly inform'd, from the Experience of a kind and loving Friend.* Sir Hugh Plat, *ibidem*.

29. *Of preserving Flesh sweet in the heat of Summer.*

You may keep Veal, Mutton, or Venison, [in the heat of Summer,] nine or ten days sweet and good, [so as it be newly and fairly kill'd,] by hanging the same in a high and Windy Room, [and therefore a Plate cupboard full of
Hole s

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Holes, so as the Wind may have a through passage, would be placed in such a Room, to avoid the offence of the Fly-blows.] *This is an approved secret, easie and cheap, and very necessary to be known and practised in hot and tainting Weather.*

Veal may be kept ten days in Bran. Sir Hugh Plat, *ibidem*.

30. *Of preserving Fish long.*

Fry your Fish in Oyl: And some common Rape-oyl; and some, of the sweetest Sevil-oyl that you can get: For the Fish will not taste at all of the Oyl; then put your Fish in Whitewine-vinegar, and so you may keep it for the use of your Table, any reasonable time. Sir Hugh Plat, *ibidem*.

31. *Of preserving Lobsters, Cray-Fish, &c sweet and good for some few days.*

These kind of Fish are noted to be of no durability [or lasting] in warm Weather: Yet to prolong their days a little, tho' I fear I shall raise the price of them by the discovery among the Fish-Mongers, [who, only in respect of speedy decay, do now and then afford a Penny-worth in them] if you wrap them in sweet and course Rags, first, moisten'd in Brine, and then bury these Cloaths in Callis Sand, that is also kept in some cool moist place, *I know by my own experience*, that you shall find your Labour well bestow'd; and the rather if you lay them in several Cloaths, so as one do not touch another. Sir Hugh Plat, *ibidem*.

My Author has this Experiment also in his *Jewel-House*; where he mentions also *Prawns* and *Shrimps*, &c. preserved by this means.

32. *Of preserving Roses and Gilliflowers, long.*

Cover a Rose or Gilliflower [that is fresh, and in the Bud, and gather'd in a fair Day,] with the Whites of Eggs well beaten; and presently strow thereon the fine powder of searced Sugar, and put them up in luted Pots setting the Pots in a cool place in Sand or Gravel. With a Fillip of the Finer you may at any time shake off this inclosure. Sir Hugh Plat's *Closet for Ladies and Gentlemen*.

33. *Of preserving Clusters of Grapes till Easter.*

Clusters of Grapes, hanging upon Lines, within a close press, will last till Easter. If they shrink, you may plump them

them up again, with a little warm VVater before you eat them. Some use to dip the Ends of the Stalks in Pitch, before they hang them up: And some cut a Branch off the Vine with every cluster, placing an Apple at the end of each Branch, now and then renewing those Apples, as they rot; and afterwards hanging them within a press or cupboard, which [as I suppose] ought to stand in such a Room where the Grapes may not freeze; for otherwise you must be forced now and then to make a gentle Fire in the Room, or else the Grapes will rot and perish. Sir *Hugh Plat*, *ibidem*.

34. *Of preserving Wallnuts a long time plump and fresh.*

Make a lay of the dry stampings of Crabs, when the Very juice is press'd from them; cover that lay with Wallnuts, and upon them make another lay of stampings, and so one lay upon another, till your Vessel be full wherein you mean to keep them. The Nuts thus kept will pill as if they were new gather'd from the Tree. Sir *Hugh Plat* *ibidem*.

35. *Of preserving Quinces in a most excellent manner.*

Make choice of such Quinces as are sound, and gather'd in a fair, dry, and Sunney day; place them in a Vessel of Wood, containing a Firken, or thereabouts; then cover them with penny-ale; and so let them rest: And if the Liquor carry any bad scum, after a day or two take it off: Every ten or twelve days let out your Ale, by a Tap-hole in the bottom of your Vessel; stop the hole, and fill it up again with fresh Penny-Ale: You may have as much for two pence at a time as will serve for this purpose.

These Quinces being baked at Whitsontide, did taste more daintily than any of those which are kept in our usual Decoctions or Pickles.

Also, if you take VVhitewine-lees that are neat, [but then I fear you must get them of the Merchant, for your Taverns do hardly afford any] you may keep your Quinces in them, very fair and fresh all the Year; and therein may you also keep your *Barberries*, both full and fair colour'd. Sir *Hugh Plat*, *ibidem*.

36. *Of preserving Pomegranates a long time.*

Make choice of such Pomegranates as are sound, and not prick'd, as they term it; lap them over thinly with VVax, and hang

hang them upon Nails, (where they may touch nothing) in some cupboard or Closet in your Bed-chamber, where you keep a continual Fire, and every three or four days, turn the under sides upmost; and therefore you must so hang them in Pack-thread, that they may have a Bow-knot at each end. *This way Pomegranates have been kept fresh till Whitsotnide.* Sir Hugh Plat, *ibidem*.

37. Of Fruit preserved in Pitch.

Dwayberries that do somewhat resemble Black-cherries, call'd in Latin *Solanum Lethale*, (*I suppose my Author means Alkakenny, or Winter-Cherries,*) being dipped in melted Pitch, being almost cold, and before it congeal and harden again, and so hung up by their Stalks, will last a whole Year, proved by Mr. Parsons the Apothecary, you may try what other Fruit will be preserved in this manner. Sir Hugh Plat, *ibidem*.

38. Of preserving Hazel-nuts long.

A Man of great Years and Experience assur'd, me that Nuts may be kept a long time with full Kernels, by burying them in Earthen Pots, (well stoppt) a foot or two in the Ground: They keep the best in Gravelly or Sandy places. But these Nuts I am sure will yeild no oyl as other Nuts will, that wax dry in the Shells with long keeping. Sir Hugh Plat, *ibidem*.

39. Of preserving Chestnuts all the Year.

After the Bread is drawn, disperse your Nuts thinly over the bottom of the Oven; by this means the moisture being dry'd up, the Nuts will last all the Year: If at any time you perceive them to relent, put them into your Oven again as before. Sir Hugh Plat, *ibidem*.

40. Of preserving Cherries all the Year, to have them at Christmas.

Take the fairest Cherries you can get, (but besure see they be not bruised,) and rub them with a Linnen Cloath, and put them into a Barrel of Hay, and lay them in ranks, first laying Hay in the bottom, then Cherries, then Hay again, &c. And then stop them up so close, that no Air come near them, and lay them under a Feather-bed, where one lyeth continually; for the warmer they are, the better, yet let them come near no Fire: And thus doing you may have Cherries at any time of the Year. Sir Hugh Plat, *ibidem*.

41. *Of preserving Roses a long time good, for Distillation; so that you may Distill them at Michaelmas, and have as good yield of the Water as at any other time of the Year.*

In pulling of your Roses, (for Distilling) first divide all the Blasted Leaves, and then take the other fresh Leaves, and lay them abroad upon your Table, or Windows, with some clean Linnen under them; let them lye three or four Hours, or if they were dewey, until the dew be fully Vanished: Put Rose-leaves in great Stone Pots, having narrow mouths, and well Leaded within, (such as the Gold Finers call their *Hookers*, and serve to receive their *Aqua-fortis*, be the best of all others that I know) and when they are well fill'd, stop their mouths with good Corks, either cover'd all over with Wax or melted Brimstone; and then set your Pots in some cool place, and they will keep a long time good; and you may Distil them at your leasure.

I have known Rose Leaves kept well in Rundlets, that have been first well season'd with some hot Liquor and Rose-leaves boyl'd together, and the same pitched over on the outside, so as no Air might penetrate or pierce the Vessel. Sir *Hugh Plat*, *ibidem*.

42. *Of preserving Oysters good for ten or twelve Days,*

Some are of opinion, that if you Barrel them up whilst they are new and quick at the Sea-side, putting some of the brackish Water where they are taken amongst them, that so they will last many days good. (*Que.* of dissolving some Salt in fresh Water till it be of the same strength with the brackish water which contains some 18th or 20th part of Salt; peradventure it will not be amiss to change your Brine now and then.)

Some pile them up in small Rundlets with the hollw parts of the Shells upward, casting Salt among them in every Lay which they make. This is a good device to send them far into the Countrey, where they are dainty, and sold by Tale. Sir *Hugh Plat's Jewel-house of Art and Nature*.

43. *Of preserving Oysters for six Months sweet and good, and in their Natural Taste.*

Open your Oysters: Take the Liquor of them, and mix therewith a reasonable proportion of the best VVhitewine-Vinegar

Vinegar you can get, a little Salt, and some Pepper: Barrel the Fish up in a small Cask, covering all the Oysters in this Pickle; and they will last a long time. This is an excellent means to convey Oysters to dry Towns, or to carry them in long Voyages. Sir Hugh Plat's Closet for Ladies and Gentlewomen.

CHAP. IV.

Experiments and Observations LUDICROUS.

THE ensuing *Experiments*, &c. are principally intended for diversion; (tho' perhaps some of them may not be altogether void of *Profit*; and others *Luciferous*,) for all Men are Naturally inclin'd to some kind of Recreation or other; and we do not in the least doubt, but that the Omnipotent Creator of all things, doth allow Mirth, Recreations, and all Moderate and Innocent Divertisements; for refreshments to our wearied Minds, as he doth sleep for the refreshment of our Bodies, and both are the better to dispose us, for the Holy Exercises of Piety, and Vertue. VVe shall add no more by way of Proem, at present but proceed to our premised *Experiments*.

1. Of an easy and pleasant Experiment to Cut a Drinking-glass in a Spiral Line like a Screw, from the brim to the foot, &c.

Monsieur Le Febury saith you may begin the slit or cut, three several ways, as first applying a Red-hot Iron to the Glass where you would begin the slit; or winde about the Glass two or three rows of thred, dipt in Brimestone, if the Glass be strong and thick, or else turning that part of the Glass where you would begin the slit to the Flame of a Lamp or Candle, if it be thin Glass; and when it is well heated by any of the three precedent ways, throw some drops of cold VVater on it, (or touch it with a wet Sponge) which will cause a crack, the which when it is begun, you may continue at pleasure; and draw it where you please, with a lighted Match, blowing upon the coalle or lighted part of it as you go along, to heat the Glass, and then reiterating the cooling

cooling with Water as before, *Le Feb. Chim.* You may also perform this Experiment as follows, Take a piece of well dry'd Matchcord, light it that it may have a good coal, then take a Beer Bowl-glass, and hold the Match to the edge of the Glass; have your Finger ready wet, and when the Glass is very hot clap your Finger to the place where it is hot, and it will suddenly Crack a quarter of an Inch downwards; then keep the coal of the Match at the like distance from the end of the Crack, and as it follows, so move your hand, and cut it Screw fashion, otherwise it will not hold together; till you have cut it to the bottom, or if you please you may cut it like Waves. When you have done it, and it is cold, (as it will soon be) take it by the foot and turn the top downwards, and the Spiral cutting will open considerable; then turn it up again, and you may drink a Glass of Beer in it, and not shed a drop. *Spor. and Past.* The foregoing Experiment, the Honorable Esq; *Boyl* mentions; for (saith he) there may be considerable motions in the sides of a Glass whilst it does not break in pieces as we may probably guess by this, that, in Drinking-glasses artificially cut by a Spirol Line, both I, and others, have often found by tryal, that, a Glass being dextrously inverted and shaken, the parts will vibrate up and down so manifestly, as sometimes to lengthen the Glass, by my estimate a quarter of an Inch and more, and yet the Glass being set again upon his foot, it appear'd that it had not been hereby at all injured. *Effect of Long. and unheed. Moti.* Now we shall shew you that this Experiment is not only for diversion, but for some use; for by this you may cut *Chymical Glasses*, when they are not formed according to your desire, and you would willingly take some part of them away.

2. *A pleasant Experiment to make Musick, or Play Tunes upon Drinking-Glasses.*

If you fill a *Drinking-glass* with Water, (especial'y one sharp below, and wide above) and fillip upon the brim, (or strike the brim with a Knitting-needle; after emptying part of the Water, and so more and more, and still try the Tone by striking the brim of the Glass; and you shall find the Tone will fall and be more Base, as the Glass is more empty. *Sylva. Silvar.*

By this Method any one that hath but small Skill in Musick, may divert himself and others by Playing Tunes upon Glasses, Tunable by putting more or less Water in the Glasses till you have fitted the Notes, so as that they may ascend gradually above each other, according to the Method of turning VVire-bells: But you must observe what the compass of your Tune is, or how many Notes there are from the highest to the lowest; for you must have so many Glasses. (And let them

them as near as you can be all of a size and shape.) Now to know the compass of any Tune that you see prickt, you must observe that every Line, and every Space is a Note: As you may observe by the 100 *Psalm* Tune, if you look in any prickt *Psalm* Book; for you will find it to be eight Notes in compass; and so likewise is the Tune call'd *Such command o're my Fate*, of both which we will give you an Instance of the Number and Notes: And first of the 100 *Psalm* Tune:

5 5 6 7 8 5 4 3 : 3 3 3 4 5 2 3 4 : 5 4 3 4 5 7 6 5 : 1 3 5 4 2 3 4 5.

The Notes of *Such command o're my Fate*.

7 7 5 3 3 1 4 5 6 4 4 2 4 3 2 3 4 6 3 5 7 7 7 : 5 6 8 8 4 4 4 3 5 4 6 5 7 5 3 4 1 3 5 5 5 3 3 1 3 5 5 5 4 2 4 6 4 3 : 2 2 3 3 5 3 5 7 7 7.

But as for the measure of time, he ought to understand Musick well, that will pretend to be a Critick at it.

3. *An Experiment for Diversion, perform'd with the Beard of an Oat.*

Juglers will take the *Beard of an Oat*, which (if you observe it well) you may see is wreathed at the Bottom, and one smooth entire Straw at the top. They rake only that part that is wreathed, and cut off the other, leaving the Beard half a Fingers breadth, in length. Then they make a little cross of a Quill, long ways, of that part of the Quill which hath the Pith, and cross wayes of that part of the Quill without the Pith, the whole cross being the breadth of a Finger high. Then they prick the bottom where the Pith is, and thereinto they put the Oaten-beard; leaving half of it sticking forth of the Quill: Then they take a little white Box of VWood, to delude the Spectators, as if something in the Box did the Trick; in which with a Pin they make a little hole, enough to take the Beard, but not to let the cross sink down, but to stick, then likewise by way of imposture, they make a Question; as, who is the fairest VWoman in the Company? Or, who hath a Glove, or Card? And cause another to name divers Persons: and upon every naming, they stick the cross in the Box, having first put it towards their Mouth, as if they charmed, and the cross stirreth not; but when they come to the Person they would take, as they hold the cross to their Mouth, they touch the Beard with the tip of the Tongue, and wet it; and so stick the cross into the Box,

Box, and then you shall see it turn finely and softly, three or four turns, which is caused by untwining the Beard by the moisture. You may see it more evidently if you stick the cross between your Fingers, instead of the Box. *Silv. Silvarion.* The Beard of a Wild Oat, is a Body of a very curious Structure (saith the ingenious Dr. Hook, tho' to the Naked Eye it appear very slight, and inconsiderable, it being a small Black or Brown Beard or Bristle, which grows out of the side of the inner Husk that covers the Grain of a Wild Oat, the whole length of it when put in water, so that it may extend it self to its full length is not above an Inch and a half, and for the most part somewhat shorter, but when the Grain is ripe, and very dry, which is usually in the Months of *July*, and *August*, this Beard is bent somewhat below the middle, namely about three fifths from the bottom of it, almost to a right Angle, and the under part of it is wreathed like a Wyth; the Substance of it is very brittle when dry, and will very easily be broken from the Husk on which it grows. If you take one of these Grains, and wet the Beard in water, you will presently see the small bended top to turn and move round, as if it were sensible, and by degrees if it be continued wet enough, the joint or knee will streighten it self, and if it be suffered to dry again, it will by degrees move another way, and at length bend again into its former posture.

If it be viewed with an ordinary single *Microscope*, it will appear like a small wreathed Spring, with two Clefts; and it wet as before, and then looked on with this *Microscope*, it will appear to unwreath it self, and by degrees to streighten its knee; and the two Clifts will become streight, and almost on opposite sides of the small Cilindrical Body.

If it be continued to be lockt on a little longer with a *Microscope*, it will within a little while begin to wreath it self again, and soon after return to its former posture, bending it self again near the middle into a kind of knee or Angle.

This oddly constituted Vegetable substance is first (that I have met with) taken notice of by *Baptista Porta*; in his *Natural Magick*, as a thing known to Children and Juglers, and it has been call'd by some of these last named Persons, the better to cover their Cheat, the Leg of an enchanted *Arabian Spider*, or the Leg of an enchanted *Egyptian Fly*, and has been used by them to make a small Index, Cross or the like, to move round upon, the wetting of it with a drop of Water, and muttring certain Words. *Mycrosf.*

4. *Of making Water to ascend Contrary to its Nature.*

Take a Bason with a Pint of *Water* in it, or thereabouts; then take an Earthen Pot or Jugg with a full belly; and light a piece of paper, and cast it into the Jugg flaming, then immediately turn the Mouth of the Jugg, or Pot downwards, and set it in the midst of the Bason of *Water*, and it will draw up a good quantity of the *Water*, if it be not more then the Pot will contain, within the belly thereof. *Arts Treas.* We will add another way by which it may be performed, and you may see the *VWater* ascend. Take a Beer Bowl-glass, and fill it half full of *Water*, then take a Bason or VWooden Bowl, and put the *VWater* out of the Glass into it; then set fire to a piece of white Paper, and throw it into the *Water*; that is in the Bowl or Bason; and suddenly, while the flame is in, cover it with the Glass, and you shall see the *VWater* ascend out of the Bason up into the Glass. *Spor. and Past.*

You may also observe the same thing in Glass with a long slender Pipe, and a globuler head, viz. Such a Glass as we call a Thermometer; the Bolt-head of one of these being warmed pretty hot by the fire, or by means of a hot Linnen Cloath wrapt about it; and then open the end of the Pipe being immediately immerst in *Water*, you shall see it ascend up along the Pipe. By this method some adjust or set up your *Water VVeather* Glasses.

5. *An Experiment, to carry an Earthen Jugg or Pot, sticking to the Palm of your Hand.*

Take a piece of paper, and set it on fire, and cast it flaming into the Mouth of the Jugg or Pot, and presently clap your Hand on the Mouth of the Pot, not hollow, but plain and smooth, the Jugg will then adhere to your Hand, and you may thus carry him many Paces, sticking to your Hand. *Art. Treas.*

6. *Of making it Freeze by the side of a great Fire.*

You must note, this *Experiment* can't be performed at any time of the Year; unless you have a conservatory for Snow, which its very probable might be preserved here in *England*, as well as in the Southern parts of *Spain*; which is a far hotter Country. The *Spanish* Physitian *Monardes*, saith that they in *Granada* in *Spain* used to keep Snow all the Summer in cold and dry places, for both moisture and heat will dissolve

dissolve it; he saith also that they tread, and press it very hard together; and that they commonly lay it in their Cellars; some affirm that if it be cover'd with Oaken-leaves it will be conserved the longer from melting. *Monardes* saith that it used to be brought to the City *Granada* in Straw; in which (he saith) it will melt less than in any other thing. But to proceed to our Experiment, at such times and places as Snow may be had, he that would perform it must have in readiness a hand full of Salt in private. Then let him procure a Joint-stool, and a Pewter-pot or Basen, a little Water and a short Stick, first let him pour a little Water on the Stool, and upon it let him set the Pot or Basen, and put the Snow into it; and also the Salt, but that privately, and then he must keep the Pot steady and fixt from moving with his Left Hand, and take the short Stick in his Right, and therewith Churn, or Mix the Salt and Snow well together; and in a few Minutes, the Pot or Basen will be Freezed, and fix so fast to the Stool, that you can hardly pull him off, you may take the Pot or Basen by the brims, and carry the Stool about the House: Nay, sometimes the Bottom of a Pewter Pot hath been spoil'd by pulling from the Stool; and this from the Authors own Experience.

It's not to be doubted that the same Experiment may be effected with congealed Water pulverized, and blended with Sal. Commune, and a little Aquavita, which last inforces the Freezing very much. Its very likely *Granado* may supply the want of the other two Coagulated matters: Since that proceeds from glaciation. *Es. Nat. Exp. Rich-cabin. Joif. New. from New. World V. P. 17.*

7. Of Cleaving or Slitting thin pieces of Silver as an old Groat, or the like.

To slit, (or divide transversly into Flakes or Leaves,) so thin a piece of Metal as an old *Groat* which (saith the Honourable Etq; *Bryl*) seems, not to exceed, if it so much as equal, the thickness of a Leaf of white paper, may be thought if it be feasible, to require some very subtle dividing Instrument, with an Edg finer than of a Rasor, and yet the way of performing *this, by Physical means, is but an almost *Ludicrous Experiment*, which is easily thus made. Take three Pins and stick them in the form of a Triangle, at such a distance from each other, that the *Groat* may rest upon the Heads of them, put upon this thin piece of metal, almost as much finely powder'd Sulphur, as will conveniently lye on it, then kindling the Sulphur take off the *Groat*, and throwing it hard against the Floor, the upper part, with the radhe-raing remains of the Sulphur, will be parted from the lower; which (lower) if the Coin were not very thin, will retain its former shape. *Us. Exp. Philos.*

8. *Of Separating Wine from Water.*

Take a Glass with a long Pipe and a Bole, head (like their common Thermome ter) fill the Bolt-head in part with Water; take also another Glass, into which put Claret, and Water mingled, Reverse the First Glass, with the Bolt-head upward, stopping the orifice of the Pipe with your Finger; then immerse the Mouth of it in the Liquor of the second Glass, and then remove your Finger; continue it in that posture for a time, and it will unminge the Water from the Wine: the Wine ascending and settling in the top of the upper Glass; and the Water descending and settling in the bottom of the lower Glass. The operation will be apparent to the Eye; for you may see the Wine, as it were, in a small vein, ascending through the Water. For conveniency (because the operation will require some small time,) it were necessary to hang the upper Glass upon a Nail: But as soon as there is gathered so much unmixed and pure Water in the bottom of the lower Glass, as that the Orifice of the upper one is immerst into it, the Motion ceaseth.

Note that if the upper Glass be Wine and the lower Water; there will follow no Motion at all. Or if the upper Glass be pure Water, and the lower colour'd Water, &c. *Contra*, then there will follow no Motion neither. It hath been Experimented, that tho' the mixture of Wine and Water, in the lower Glass, be three parts Water, and but one Wine, yet it doth not dead the Motion.

This separation of Wine and Water, appeareth to be performed by weight, for it must be of Bodies of different specifick Gravities, or else it will not take effect; and you must observe the heaviest Body must ever be in the upper Glass. But then Note, that the Water being made pensile, and there being a great weight of Water in the Bolt-head, sustained by the small cilinder, of Water in the Pipe, it is that which is the cause of the operation; for Water and Wine in one Glass, with long standing will hardly Separate.

This Experiment would be extended from mixtures of several Liquours (saith the Vicount Verulam) to simple Bodies, which consists of several similar parts: It would therefore betryed with Brine or Salt-Water, and Fresh-Water, placing the Salt-Water, which is heaviest) uppermost, and observe whether the Fresh will not come above it. It would also be tryed with Water Sugared, and pure Water, and see whether the Water which cometh above will lose its sweetness. For which purpose it were convenient to have a little Cock in the Bolt-head, *Silv. Silvar.*

9. *Of preparing a Liqueur which shall boyl of it self; and that too, when it is actually cold. And also how to make it hot, and that without Fire.*

To perform this Experiment take Oyl of Vitriol, and put it into a Vessel, and put to it grossly pulverized Sal Armoniack; this mixture will produce a cold Ebullition which will grow colder and colder for a certain time. Then this actually (and) considerably cold mixture, being put into three or four times its own weight of *Aqua Communis*, that is actually cold, it will then immediatly, grow hot. *Boyls Phos.*

So likewise if you pour, *Aqua fortis* upon a convenient proportion of Sal Tartar, there will be at first a great Ebullition produced, and whilst that continues, store of Red and noisom Fumes will be elevated, but will not long out last the commotion of the mixture whose active parts will in no long time combine into a kind of Nitrous Salt. *Lang. and unheeded moti.*

10. *Of Writing one's Name or what you please on Paper, and then burning it; and afterwards reading it when the Paper is burnt.*

To perform this Experiment, Take a new clean Pen, that was never written with, and dip it in your own Water as you do in Ink; then strip up your Shirt Sleeve above your Wrist, and upon your Arm Write your own Name, or any other Name, or make what mark you please, and then let it dry on your Skin, and nothing will be seen; then put down your Sleeve, and button your Wrist-band, &c. (Do this privately, and it will cause admiration in some) then take a peice of White-paper, and Write the same thereon as you Wrote on your Skin; with another Pen of black Ink; (But let it be writ as like the other as you can) then take the paper and burn it, and lay the Ashes on a Table or the like; and stripping your Sleeve rub the Ashes hard with your Finger, where you had Written with your Water, then blow off the Ashes, and the Name or Mark, may be distinctly read on your Arm. *Rich. Cabi.* After this method you may (for diversion,) pretend to tell *Maids* their *Sweet-hearts Names*; which you must thus manage, when you have heard, of some particular Person that keeps any Maid Company pretty much; you must privately Write his Name according to the preceeding method upon your Arm: Then when you are in Company, you may to blind their Eyes, Write

Write several young Mens Names on a piece of paper, and then burn it as before and save the Ashes; then unbutton your Waistcoat and Shirt-sleeves and strip up your Sleeve, and tell the Maid that if she do but rub those Ashes upon your Arm, (pointing to the place whereabouts she should rub them on) she shall see her Sweet-hearts Name appear upon your Skin; the which, you may tell the Company, is performed, by means of an occult quality in your Arm, and a conspicuous Fricating operation of the Maids Hand. Thus you may make diversion with several Lasses at the same time; by having beforehand Written their Sweet-hearts Names privately, on diverse parts or places of your Arm; but you must then be sure to remember which place is for each Lass.

From the Principles of the preceding *Experiment*, the *Honourable Esq; Neil*, undertook to teach a Person of Quality; an easy way of sending a Written Message, without putting it into the power of the Eearer to betray it, which, saith he, I could easily have performed my self if the Message were to be deliver'd in a short time, and not too far off, by Writting on his Back; or other convenient part of his Body, with a clean Pen, dipt in my own Urine (there being some Urines, with which I have found (to my words) that the Experiment would not succeed) for if he that receives the Message, rubs but a little of the black substance remaining after the paper is burnt, those fable parts adhearing to those other of the Liquor, that lurk yet in the pores of the Skin, (whence if the Messenger went fast, and very far, the Sweat would Probably dislodge them) do denigrate all that is VVritten, and make it legible enough, sometimes, as I have tryed, after many hours. *Use. Nat Phyl.s.* Now we are on this subject of Writing in secret, we will add some pleasant Experiments of this nature.

II. Of Secret Writing by means of the Ink.

Thus if a Man VVrite with *Sal Armoniack* dissolved in VVater, the Letters will not appear legible, till the paper be held by the Fire. This others affirm to be true also in the juice of Onions, Lemons, with diverse the like acid corroding moistures. But indeed the heat of the Fire only detects that, which in a little time had disclosed it self, for such is the Nature of those corroding moistures or acids, that they cannot be long good Secretaries. And on the contrary those Letters that are VVritten with *Allum* dissolved, will not be discernable till the paper be dipt in Water.

Those Letters that are VVritten with *Uirne Goats-Fat*, or *Milk*, (some say) or any other glutinous moisture, will not be legible till Dust or Ashes are scattered upon it, which

are by adhering to those places will discover the VVriting, This way is mentioned by *Ovid, de Art Amand.*

And it is thought that *Attalus* made use of this piece of Policy, to excite and encourage his Souldiers before he engaged in Battel with the *Gauls*, his Enemies, who were superior in Number. The story runs thus, *Attalus* having appointed a day for Sacrifice, to the Gods for Suecess, as he pull'd out the Intrals of the Beasts, he described upon them these Words *Regis Victoria*, which he had before Written backward in his Hand with some Gummy juice, and as the Intrals were turned up and down by the Priest to find out their signification, the Letters did by that means gather so much Dust as to appear legible, by which *Omen* the Souldiers were so strangely heightened in their hopes and valour, that they got the Victory indeed. *Secret and Swift Mes. Crypt. P. te.*

Whereas some are for steeping the *Sal Amniack* in Water, Mr. *Leybourn* in his plea with Profit, is for steeping the Powder in Vinegar, when you have Writ what you please (saith he) therewith upon white Paper, let it be through dry, and nothing will be discern'd, but hold the paper a little while against the Fire, and you shall see all that was Written, as black as if it had been Written with Ink. If you Write with the juce of *Lemon*, it will do the same. *Plea. with prof.*

If you take Roach-Allum, and boyl (or dissolve it in fair Water) till it be very strong; then Write therewith upon Venice, or (what you please) thin Paper, so that when it is through dry, nothing will be seen: But take the Writing Paper, and draw it through a Bason of fair Water, till it be thoroughly wet, and then what you VVrite will appear as if it were VVritten with white upon the wet paper. *Plea. with Prof.*

There is a Secret way of VVriting with the Yolk of a raw Egg, dissolved in Fountain-water, the Letters of which being thoroughly dry, the Confederates black the whole Paper with Ink, which being dried, the Ink falls from the Letters, first described when scraped gently with a Knife. *Crypt. Catef.*

Scotus tells us, how we may VVrite Secret with two several Inks, the method is this, Mix a little common Ink with so much water, that little or nothing of blackness appear in it; with this VVrite your Secret intentions on clean Paper; when it is thoroughly dry, VVrite an ordinary Epistle with another Ink, (made of Gun-powder, beat and mixt with Rain-water,) upon the very Letters you described before, the last Ink will wash off with a Sponge dipt in VVater wherein Galls hath been boild which will also blacken the first *i id.*

Letters VVritten with dissolved Tragacanth and white-Lead, will not be visible until the writing be held between the
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the Sun, a Star, or Candle, &c. and the Eye. *Schotus* affirms, that a VVriting may be so contrived, that the Letters shall not be legible till the paper be burnt black, and the written parts of it still to remain white, which is performed by mixing Vinegar made of VVine, and the VVhite of an Egg, with Quick-Silver or VVhite-Lead; and writing therewith, or with Gum, or any kind of Salt, &c. Or with such Liquours as render the Letters described incombustible. *Ibid.*

12. *Of making Writing Vanish, and appear again.*

Take a Tub of Tartar burnt, which dissolve in common water, and Filtrate it, and when you would make use of it strike it over the VVriting, and it will suddenly Vanish. And then to recover it again, Take an ounce of white Vitriol, dissolve it in a pound of VVater, which filtrate, then strike the Paper over with it; and presently the Letters will appear as before. *Lemer, Mod. Curios.*

13. *Of Writing so as it shall be Invisible, and afterwards make it appear.*

Take a quarter of a Pint of distill'd Vinegar, which put into a vial, wherein must be half a grain of Litharge of Gold in fine Powder, stirring it from time to time, four or five times an Hour: Then pound off what's clear into another vial by inclination, and throw away the Draggs, stopping the Bottle close, and keep it against you would VVrite white, or the double Letter, with the following Ink, which you must thus make: Take Cork, as much as you please, burn it well, and when it flames no longer, put it into a Dish, with a little *Aquavite*; and cover your Dish close with another, then pound it well, and make it up into a Paste, which keep to use thus: Take some of this Cork burnt and pulveriz'd, and dissolve it in the VVater; put it to Cotton, like other Ink; with this last Ink you may VVrite any thing, upon or over what you have VVrit with the Litharge Ink, which was to write invisible with; then to make a VVater which will make the second Ink vanish, and the first appear; Take Rose-Water and Sorrel-water, of each an equal quantity, which put a vial, and add to the quantity of a Pint of these Liquors two grains of unslaked Lime, and one of orpine, both well beaten and mixt, stirring all from time to time, as the first was to be, take off the clear by inclination, after it hath stood fifteen or twenty Hours, throw off the Lees, and when you would make the second Ink vanish, and the first appear, put one or two drops upon the Line, and with a little Cotton make it run upon the place where your writing is, and it will appear. *Le Mer. Mod. curi.*

14. *Of Writing so that it shall not be seen only in the Dark.*

This *Experiment* is performed with Phosphorus; but you must note there are two sorts of Phosphorus, viz. The Fluid and the Solid; the Fluid is such, that if the Hands and Face be rub'd with it, and the party goes into a Dark place; the party will look as if he were all on Fire: And the Solid, tho' you can take it in your Hand, yet if you hold it long it will burn you; Wherefore it is kept in water, but rub a piece of this on paper it will set it on fire; and if you Write with it on paper, nothing is seen; but carry it into a Dark place and you may very plainly read it: And the Letters will look as if they were Flame, and yet the paper shall not be burnt. This was very surprising till it grew common. Esq; *Hought Impor. of Trade and Husband.*

As for the use of Secret Writing, I think I need not mention: For almost every one, hath one time or another occasion to convey some secret, to their Friends or Relations, Which they would not willingly the World should know. And then as for Diversion, there may be a thousand Fancies which may be Acted by it.

Before I conclude with Writing I shall here add a Secret.

15. *Of Writing without Ink.*

I had, (said the Honorable Esq; *Boyl*.) not long since the Honour to be known to a very great Court Lady, who was much troubled, that having frequent occasion to write Letters, she could scarce handle a Pen without blacking her Fingers with Ink; I smilingly undertook to make her Write without Ink, which I my self was formerly won't to do, by first preparing my paper with a Powder made of Copperas slightly calcin'd upon a Fire-Shovel it grow friable; and Galls, and Gum-Arabick finely pulveriz'd, and exquisitely incorporated with the Vitriol in a certain proportion; which tho' a few tryals better inform than Rules, (because according to the goodness, and calcination of the Vitriol, the proportion of the other Ingredients must sometimes be varied,) yet to assist you in your first guesses, I shall tell you, that (for the most part) I used my self three parts of calcined Vitriol, two parts of Galls, and one part of Gum-Arabick, and mixed them not, before I was ready to imploy them; for this Powder being with a Hares-foot, or any other convenient thing, carefully rub'd into the paper, and the looser Dust struck off, doth without discolouring it, so fill its pores with an Inky

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Inky mixture, that as soon as it is Written upon with a clean Pen, dipt in Water, Beer, or such other Liquors, the Aqueous part of the Liquor dissolving the Vitriolate Salt, and ad-hearing particles of the Galls, makes a legible blackness immediately discover it self on the paper: *Use of Nat, Phyls.*

16. *Of making new Writing look old*

Several times (saith the Honourable Esq; *Boyl*) I have had occasion to make a word or two that was but newly Written, look as if it had been Written long before; I perform'd it by lightly moistning the words I would have to look old, with Oyl of Tartar *Per deliquium*, allay'd with more or less fair VWater, according as I desired the Ink should appear more or less decay'd, which Experiment may be often useful in Manuscripts, to keep the recent interlineations, or other Additions, from betraying themselves, by their freshness not to have been Written at the same time with the rest of the Manuscript. *ibid.*

17. *Of making Ice in Summer.*

To perform this Experiment, take a large Stone-bottle that will hold three quarts, put into it two grains of refined Salt-Peter, half a grain of Florence Orris; and fill it up with boyling water, and stop it close, and immediately let it down into a deep VWell, leaving it two or three Hours; then take out the Bottle, and break it to get out the Ice, which will be very hard, and as good as the Natural. This Experiment will be of use to the 6th of this Chap. and also to *Cool Wine in the Summer*, which may also be refrigerated by dissolving about a pound of Nitre in a Bucket of VWater; and into that put the Bottles of VVine to Cool. *Le mer. Mod, Curios.*

18. *Of Hanging a Pail of Water upon a walking Stick or Staff, which shall be only laid upon a Stool or Table, and the Pail shall have nothing under him to support him.*

To perform this Experiment, take a short Staff or Stick and lay it a pretty way on a Table or Stool (so that it roul not off) and let the other end Hang over the Table, then take a Pail of VWater, and Hang the Bail on the Staff, and there stay it till you have fitted another short stiff Stick, which must be placed very tight between the bottom of the Pail, and

and the Staff the Bail is put over: This short Staff being thus placed very stiff and tight, a little without the Bail from the Table-ward, down against the inside of the bottom, not far from the middle. And then you shall see the Pail of Water Hang from the ground upon the long Staves end which lyes on the Table, without falling: Which seems very strange, but this is something difficult at first, till you hit it just in the center of Gravity: yet I have often done it, said Mr. White in's *Rich Cab.*

This Author hath Hang'd a Pail of water thus on a stick about a Foot and half long. You may win a wager (if such as never saw it done) by this, and also by the two following Experiments, the first of which is.

19. *Of making two Knives (with a short Stick) to Hang upon the Brim of a Glass without falling.*

This Experiment is thus performed; Take a little Stick about four or five Inches long at the most, it may something resemble the shape of a Butchers Scuer; and then get two Knives pretty near of an equal Gravity and length; and stick in the Points of them towards the bigger end of the Stick, with the flat of each Knife parallel to the grain of the wood; and in such a position that each Knife may make an accute Angle with the Stick; and also that the Knives may form an accute Angle betwixt themselves, if that your Knives be not too Short, and your Glass too bigg; for you must note that the Knives must bestride the Glass as they hang: For the nearer you can bring them to the Glass, the faster they will hang: But you must not let the Hasts touch the Glass: Your Knives being thus adapted; and the small end of the stick put upon the Brim of a Glass of Vine or Beer, you may venture to take the Glass up and drink, and they will not fall off. *Rich Cabin.* This I have (also) often done my self.

20. *Of filling a Glass Brim-full of Liquor, and afterwards putting many pieces of Money into it.*

This Experiment may be thus put in Practice, Take a pretty broad-brim'd Drinking-Glass, (the broader the better) and set him where he may stand very steady, and then carefully fill him with either Water, Vine, Beer, or any other Liquor; and in filling him be sure to be cautious that you do not wet the Brim; to prevent which, you may fill him almost full with a Funnel, and then fill him up to the brim with a Spoon: But you must observe that he stands Level, as well as steady, that he be not full at one part of the Brim before the other.

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When you have according to these directions fill'd him so full that it seems to be ready to run over; you may then Challenge to lay a Wager with any Man; that you will yet put in ten shillings into the Glas before it runs over; To perform which, you must let the pieces of Money drop in very gently; the Author hath by holding each shilling, in a pair of pincer-fashion'd Nut-crackers, till he had put them a little way into the Water, and then let them drop; by this means a Glas which was brim-full before, contained above twenty shillings before it ran over.

21. *Of putting a Candle under Water, and it shall not go out; or a Handkerchief, and not be wet.*

Take a Cup or Glas, not too small, the Mouth ought to be larger then the bottom (something) cross the Mouth fit in a little Stick, on the Stick fasten a bit of Candle: Then carefully depress the Glas into the Water, so that the Brim all round touch the Water at the same time, you shall see the Candle burning in the Glas after it's under Water, and you may so take it out burning again, if you do it carefully and softly and in due time. A Handkerchief may by this method be put under Water and not wet, if it be thrust close together at the bottom of the Glas or Cup.

22. *Of a Way how a Man may safely put his Finger or Hand into melted Lead, without any Danger of burning.*

Take of Quicksilver one ounce, Bole-Armoniack of the best two ounces, Camphire half an ounce, common Aquavita two ounces; first beat, and then mingle all these well together with a Pestle in a Brazen-Mortar; then annoint your Hands all over throughly well with this Oyntment, and besure that your are clean without Itch or Scab. I did see a Dutchman call'd Hance, a pretty nimble Chymist, who after he had set some Lead on the fire in a melting Pot, (till it became blewish and exceeding hot,) he stirr'd the same first with his Finger up and down, pretending to see whether it were not too hot to endure in the Palm of his Hand; and afterwards telling his fellow that it was of a Good temper, he caused him to pour the same out (being some half a pound in weight) into the Palm of his Hand, (first prepar'd as before,) and presently he pour'd it into his other Hand, and so out of one Hand into his other, five or six times together; till in the end he threw the same cold upon the Ground.

This he did for a Pot of Beer in a Garden in Southwark about

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about ten or twelve Years since (says my Author; his Boord was published in 1694.) In the presence of my self and divers others, at which time I Wrote the Receipt, even as I did both see him make it, and use it my self, disburfin^g the Charge both of the Beer and the Ingredients. Sir *Hugh Plat's Jewel House of Art and Nature*,

23. *Of holding a Hot Iorn-bar in ones Hand without burning the Flesh*

Dip your Hand in melted Glew, (but take heed the Glew be not too hot,) and presently strew the Powder of Horn burnt to Ashes upon the Glew; then dip your Hand again in the Glew, and strew more of the said Powder thereon. Note, that the thicker your Bar is, the thicker Crust you must make upon your Hand.

This I learnt of an old and Skilful Man, that yet liveth, who assur'd me that he had often made tryal thereof. Sir Hugh Plat, ibid.

Qure. If this be not a good device to defend Mantle-trees, and (other peices of Timber that stand near the Fire) from burning. Take an equal portion of Fish-Glew and Allom, mingle them well together, the Glew being first dissolved in Wine-Vinegar; then parget over whatsoever thou wilt with this composition, and throw the same into the Fire, and it shall not burn. This out of the secrets of *Wickerus*. 110. See *Cardan de Rerum Varietate*. Sir *Hugh Plat, ibid.*

24. *Of Engraving Arms, Posies, or other Devices, upon an Egg.*

Dip an Egg in melted Suet, thus: The Suet being melted and pretty warm, hold the Egg between your Thumb and Fore-Finger, and quickly dip one end therein, and hold it in your Hand till it be cold, and then dip in the other end in the same manner, that it be thinly cover'd all over; then take a little Bodkin, or Ncedle, and Work or Grave, in the Suet what Letters, or Portraitsures you please, taking away the Suet clean, and leaving the Shell bare at the bottom of your Work; Then lay the Egg thus Engraved in good VVine-Vinegar (or strong Alliger, in a Glasse or Stone Vessel,) for some six or eight Hours, more or less, according to the strength and sharpness of the Vinegar; then take out the Egg, and (in water that is Blood warm) dissolve the Suet from the Egg; then lay the Egg to cool, and the VVork will appear to be Graven in the Shell, of a Russet colour; *often proved*

And if the Egg lie long enough in the Vinegar, after it is so Engraven and cover'd with Suet as before,) the Letters or VVork

Work will appear upon the Egg it self being hard boyld, and so it may be serv'd up at the Table: Or if you care not to lose the Meat, you may pick out the same when the Shell is through Graved, and so you shall have a strange piece of Work perform'd. Sir Hugh Plat, *ibid.*

25. Of an appearance of strange Forms in a Glass.

Grinde an Angel weight of fine Leaf Gold, (with two ounces of Sal Armoniack) upon a Marble, till you can scarcely discern any Gold; then take two parting Glasses, containing a Pint each; in the one put the ground Gold with four ounces of good Strong-water, and in the other Glass put four ounces of Mercury with eight ounces of Aquafortis; set both these Glasses in warm Ashes upon some Furnace, till both the Bodies be dissolved; then take a Glass of a Quart, and whilst the Substances (being dissolv'd) are yet warm, pour the same into your Quart Glass; but first you must put in your Strong-water wherein the Mercury was dissolv'd, (*I write according to the practice which I did see*) and then pour the other Water upon that, and presently you shall see an extream thick Blackness, which a Dutch Alchymist and practitioner of Physick that dy'd of the last Years Plague (upon the Discovery thereof) would maintain to be that *nigrum nigro nigrum*, so much spoken of amongst the Philosophers. And after a while when the Water began to clear, then he term'd it *Coelum Christalinum*; after that did appear a continual rising and falling as it were of flakes of Snow, which continu'd certain Hours, and then as it were a Hill cover'd with Pearl, and that he call'd *Sepulchrum Moysi*. All which composition having stood one Night, there appear'd divers Spires like Blades of Corn or Grass (but of a Whitish colour) in the bottom of the Glass.

There is a like Work to be perform'd in Silver; whereby *I have seen* several forms and shapes of things sometimes to spring up suddainly, and sometimes in a Night or owr, the same sometimes representing Trees Shrubs, Hedges, and Flowers, and divers other Shapes; and notwithstanding many practices to find out the Reason of the Differences of these Formes, I could never yet make any one Form twice, but nature would play so infinitely, and at her own pleasure herein, that tho' I did observe a just proportion of all the Ingredients of this Magistery, yet (because she found some difference of poise, when she weigh'd them in her own Balance) I had always a several and differing Form from the last which I made. Sir Hugh Plat, *ibid.*

26. *Of making an Egg to stand on one End.*

This may be done (to win a Wager) by setting the Egg in Salt. But this may be done more artificially, thus: Hold an Egg in your right Hand, and with your Fist give three or four strong Blows upon your left Arm; or use any other device by agitation or shaking, till you have broken the Yolk, and so made the VVhite to mingle confusedly with it, and then it will presently stand upon the broad end on an even Table. It should seem, (that before the breaking of the Yolk) that the Yolk did hang playing or tottering within the VVhite, whereby the Egg could not be made to stand speedily without this device. And yet I have heard a Gentleman (whom I dare believe in a greater matter than this,) affirm, that he has divers times caused an Egg to stand alone, by poizing it to and fro between his Hands, till in the end it stood upright without any other help. But the first is the readier way. Sir Hugh Plat, *ibid.*

Add to this, that I remember to have somewhere Read a Story of *Christ. Columbus*; who, (after he had discover'd *America*, or the New VVorld,) being in company with some conceited Fellows, that slighted his discovery, as a thing of small moment, and no more than another might have done as well as he; (to convince them, in some measure, of their Folly,) took an Egg, and asked them which of them could make him stand alone on his little end; which when they had try'd (and were not able) to perform; he took the Egg, and gently bruising the little end with the Edge or Back of a Knife, he presently made it to stand alone on that End; saying to the Company, *There*; now, I suppose you can do *this* too; now you have seen it done.

27. *Of making a conceited Drinking-glass, wherein many sorts of Fish will seem to swim up and down.*

In the midst of a Good large Drinking-glass, and of a bole fashion, let a short Pillar of Glass arise, upon which a round Ball or Globe of Glass must be placed; upon which Ball there must be divers sorts of small Fishes well Drawn and Limned: Then fill the Glass either with VVater, or with VVhite or Rhenish VVine, and the least motion that can happen either to the VVine or VVater, will make the Fishes seem to play up and down in the Glass. Sir Hugh Plat, *ibid.*

28. *Of putting several sorts of Liquor in the same Glass, without mixing.*

Take a Beer-Glass of 6 or 8 Inches in height, and being of an equal bigness from the bottom to the top; then pour therein some fair VVater, an Inch or two in height, upon
which

which lay a round Trencher that is almost as big as the inside of the Glass; then (out of a long Spouted Glass or Pot,) pour gently some Milk upon the Trencher, and after that some Rochell or Connyack VVhite-wine, and then some Gascoign Claret-wine, and after Sack; and so you shall have each Liquor or VVine to float upon the other, without mingling together, because the fall thereof is Broken by means of the gentle pouring upon the Trencher.

Some affirm, that the same may be perform'd with a round piece of Bread. But you must always have a special care, that the heaviest Liquor be pour'd in first, and so proceeding from heavier to lighter, so as the lightest be uapermost; (otherwise they will mingle) for every thing desires to be in its Natural place, according to its specifick Gravity. Sir Hugh Plat, *ibid.*

29. *Of making a Candle seem to hang in the Air,*

This will make a strange Show to the Beholders that know not the conceit: It is done in this manner: Let a fine Virginal-wire be convey'd into the midst of the Wick of the Candle, and left of a convenient length above the Candle, whereby to fasten it to the Cieling of the Room; and if the Room be any thing high pitch'd, it will be hardly discern'd; and tho' the Flame consume the Tallow, yet it will not melt the VVire. Sir Hugh Plat's *Closet for Ladies and Gentlewomen.*

30. *Of tinging all the Things in a Room of a Green, Azure, Crimson, or any other Light Colour.*

I remember the admirable Kircher has a parastatical Experiment (as he calls it) of Glossing the inside of a Chamber, and all the Things [as well Furniture as Persons] contain'd therein, with a pleasant disguise of Grass Green, Azure, Crimson, or any other Light Colour; [for Black cannot consist in any Liquor, without so much Density, as must terminate the Light:] And this he performs only by disposing a capacious vial of Glass [fill'd with the Tincture of Verdegrease, Lignum Nephriticum, or Vermilion, &c. In some Aperture of the Window, respecting the incident Beams of the Sun. Kircher's *Magn. Lucis, & Umbrae*, lib. 10. part 2. *Magia, Parastatica Experiment 5.*

31. *Of making Water to boil and run over the Top of a Glass.*

Tho' I have sometimes unsuccessfully try'd this Experiment; yet because several good Authors have asserted it as real matter of fact, [and because my failing herein might be for want of a due understanding of some circumstances of it,] I shall here set it down in their own words. First,

First Mr. White [in his *Rich Cabinet*,] says; take a Glass near full of Water, and setting one Hand upon the Foot thereof, hold it fast, and turn slightly one of your Fingers of your other Hand upon the Brim or Edge of the Glass; having before privately wet your Finger, and so passing softly on with your Finger in pressing a little, the Water will seem to boyl and leap over the Glass by Drops. But I do not so much insist on this Author, as on those that follow.

Secondly, *The Lord Verulam*, (in his *Sylva Sylvarum Experiment 9.*) says; Take a Glass and put Water therein, and wet your Finger, and draw it round the Lip of the Glass, and pressing it somewhat hard; and after you have drawn, it some few times about, it will make the Water frisk and sprinkle up in a fine Dew. For the pressure of the Finger further'd by the VVetting, [because it sticketh so much the better to the Lip of the Glass,] after some continuance, putteth all the small parts of the Glass into work, so that they strike the VVaters Sharply; from which percussion that sprinkling cometh.

Thirdly, the Honourable *Robert Boyle Esq*; [in his *Languid and unheeded Motion*] says; an Instance of the great Effect of Languid and unheeded Motion, is afforded, by the known; *Experiment* of passing one's wetted Finger upon the Orifice of a Drinking-Glass almost fill'd with water. For tho' the Eye does not immediately discern any motion, that [by reason of the pressure of the Finger] is made by one part of the Glass upon another; yet, that a Vibrating motion is thereby produc'd, may be argu'd, by the dancing of the VWater; especially that which is contiguous to the prest sides of the Glass, by which 'tis often times so agitated, that numerous Drops are made to leap quite over, and others are tossed up to a good height into the Air.

Fourthly; To what has been said, I shall only add, That I know one or two credible Persons, who affirm to me, that they have often perform'd this Experiment.

32. *Of making the Flame of a Candle to be four or five times bigger than ordinary, and to appear in a Globular Figure, and not in a Pyramid as commonly.*

Take a small Wax-Candle, and put it in a Socket of Brass or Iron; then set it upright in a Porringer full of Spirit of Wine, heated; then set both the Candle, and Spirit of Wine, on fire; and you shall see the Flame of the Candle open it self, and become four or five times bigger than otherwise it would have been, and appear in the form of a Globe, and not, [as is usual] of a Pyramid. You shall see also, that the inward Flame of the Candle keepeth Colour, and doth not wax any
with

Whit bleu towards the Colour of the outward Flame of the Spirit of Wine. *Ld. Bacon's Sylva Sylvarum. Experiment. 31.*

33. *Of burning Aqua-Vitæ in the Hand, without hurting the Hand.*

We see [says my Author] that if the Palm of the Hand be anointed thick with Whites of Eggs, and then Aquavita be poured upon it, and enflamed; yet one may endure the Flame a pretty while. *Ld. Bacon's Sylva Sylvarum, Experiment. 860.*

34. *Of putting an Egg into a Vial.*

Mr. Hill [in his *Natural and Artificial conclusions*] tells us, that if you steep an Egg two days and two nights in Vinegar, and then roll it softly on a Table, it will stretch as VVax; and so you may put it in a Vial, or draw it through a Ring

And the *Honorable Esq; Boyl* [in his *usefulness of Natural Philosophy*] saith, *I have* sometimes [for curiosity sake] taken an Egg, and steeped it in strong Vinegar, for some days, and then taking it out, the Shell was so eaten away, that the Egg could be squeez'd into unusual forms; but the Skin which involves the VVhite, continu'd altogether unfretted.

35. *Of making Water, Flower, or Sand to ascend.*

It is a common *Experiment*. Take a Pot, [or better Glas, because therein you may see the Motion,] and set a lighted Candle in the bottom of a Bason of VVater; and turn the Mouth of the Pot, or Glas, over the Candle, and it will make the VVater rise. And it proceedeth thus. The Flame of the Candle, as soon as it is cover'd, [being suffocated by the close Air] lesseneth by little and little; during which time, there is some little Ascending of Water, but not much: But upon the Instant of the Candles going out, there is a suddain Rise of a great deal of Water.

The same effect is observ'd, if instead of water, you put Flower, or Sand into the Bason. I have sometimes seen the Glas, being held by the Hand, has lifted up the Bason and all: That Experiment when the Bason was lifted up, was made with Oyle, and not with Water. *Ld. Bacon's Sylva Sylvarum.*

36. *Of Charming of Serpents.*

What we have here said (says my Author) concerning the Magick of Harmonious Sounds; [both upon the Tarantula it self, and those unhappy Men, whom its fasciuating Venom hath Tarantuliz'd,] as it doth wholly take off the Incredibility of those Relations, which some Natural Magicians have set down, of the *Incantation* [or charming] of Serpents, by a Wand of the *Cirrus, or Dog Tree*: So doth it also give us no obscure Light into the Dark cause of the effect, which among the Ignorant and Superstitious hath ever passed for merely par-
stigious

stigious and diabolical. For, *it being certain*, that all Serpents, are most highly offended with the smell, and influx of those invisible Emanations proceeding from the Cornus, by reason of some great disproportion or impossibility, betwixt those subtle Effluvia's, and the temperament of the vital, and Spiritual substance of Serpents: Infomuch, that in a moment they become strongly intoxicated thereby. Why should it seem impossible, that he, who understands this invincible enmity, and how to manage a Wand or Rod of the Cornus with cunning and dexterity; having first intoxicated a Serpent by the touch thereof, should, during that fit, make him observe and readily conform to all the various motions of the Wand? So as that the unlearned Spectators perceiving the Serpent to approach the Enchanter, as he moves the Wand nearer to himself; to retreat from him, as he puts the Wand from him; to turn round; to dance, as that is waved too and fro; and lie still, as in a Trance, when that is held still over him; and all this while knowing nothing, that the simple vertue of the Wand is the cause of all those mimical Motions and Gestures of the Serpent: They are easily deluded into a belief, that the whole Scene is supernatural, and the main Energy radicated in those Words, or Charms, which the Impostor, with great ceremony and gravity of aspect, mutters forth, the better to disguise his Legerdemain, and dissemble Nature in the colour of a Miracle. *Dr. Charleton's Physiologia.*

37. *Of an Experiment to Spit three Capons upon one Spit at one time, and to have an equal Fire to each of them, and yet one to be quite Raw, another well Boyl'd, and the third well Roasted.*

I have heard, that this conceit was perform'd (by a Noble Man's Cook) upon a Wager; and thus he did it. To tend the the first Capon, he had a Boy that continually pour'd cold Water on the same, and so kept it Raw.

To the second, he had another like Attendant, to pour (continually) scalding Water upon; and that was well Boyl'd.

And the third he tended himself, Basting it with Butter; and that was thoroughly Roasted; and so won the Wager. *Mr. White's Rich Cabinet.*

We could add more Experiments; but, for reasons formerly mention'd, we must (at this time) here make.

AN END.

